SCIENTIFIC AMERICAN

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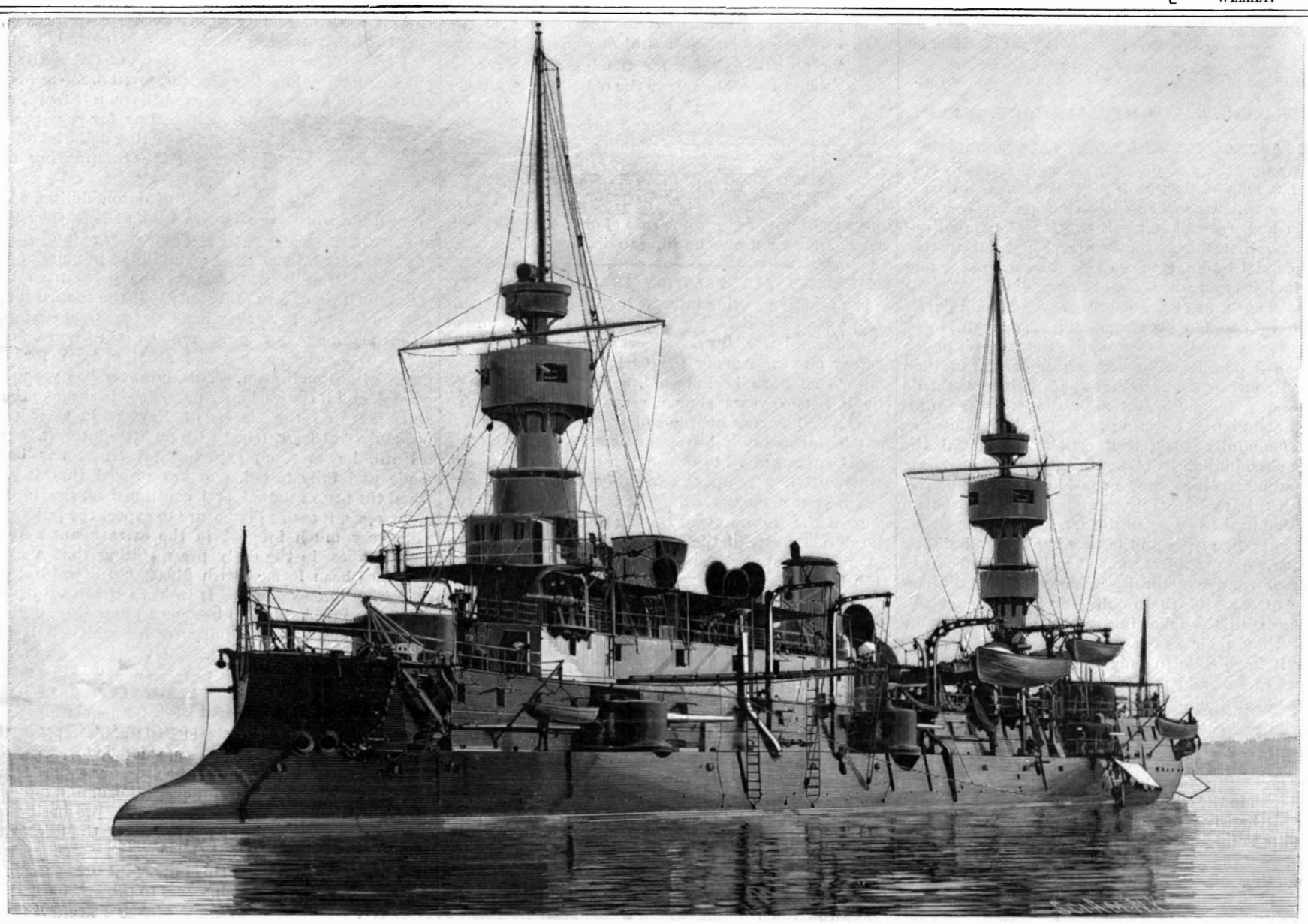
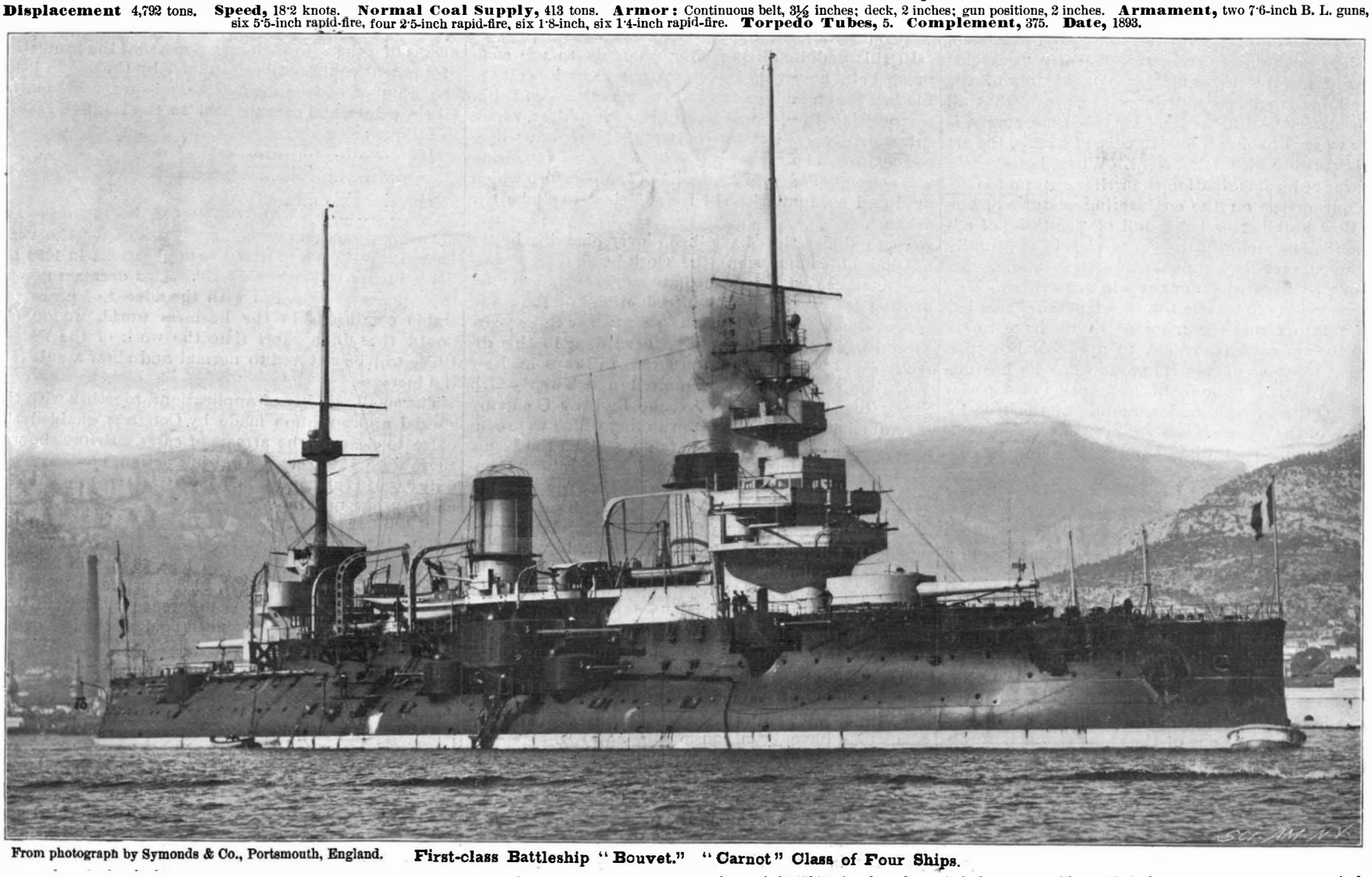


Armored Cruiser "Charner." "Bruix" Class of Four Ships.

Displacement 4,792 tons. **Speed,** 18·2 knots. **Normal Coal Supply,** 413 tons. **Armor:** Continuous belt, 3½ inches; deck, 2 inches; gun positions, 2 inches. **Armament,** two 7·6-inch B. L. guns, six 5·5-inch rapid-fire, four 2·5-inch rapid-fire, six 1·8-inch, six 1·4-inch rapid-fire. **Torpedo Tubes,** 5. **Complement,** 375. **Date,** 1893.



From photograph by Symonds & Co., Portsmouth, England. **First-class Battleship "Bouvet." "Carnot" Class of Four Ships.**

Displacement, 12,200 tons. **Speed,** 18 knots. **Normal Coal Supply,** 621 tons. **Armor:** Continuous belt, 15¾ to 8 inches; deck, 3½ inches; gun positions, 14½ inches. **Armament,** two 12-inch B. L. rifles, two 10 8-inch B. L. rifles, eight 5·5-inch rapid-fire, eight 3-inch rapid-fire, twelve 1·8-inch, and twenty 1·4-inch. **Torpedo Tubes,** 4. **Complement,** 631. **Date,** 1896.

NAVIES OF THE WORLD—III. FRANCE.—[See page 56.]

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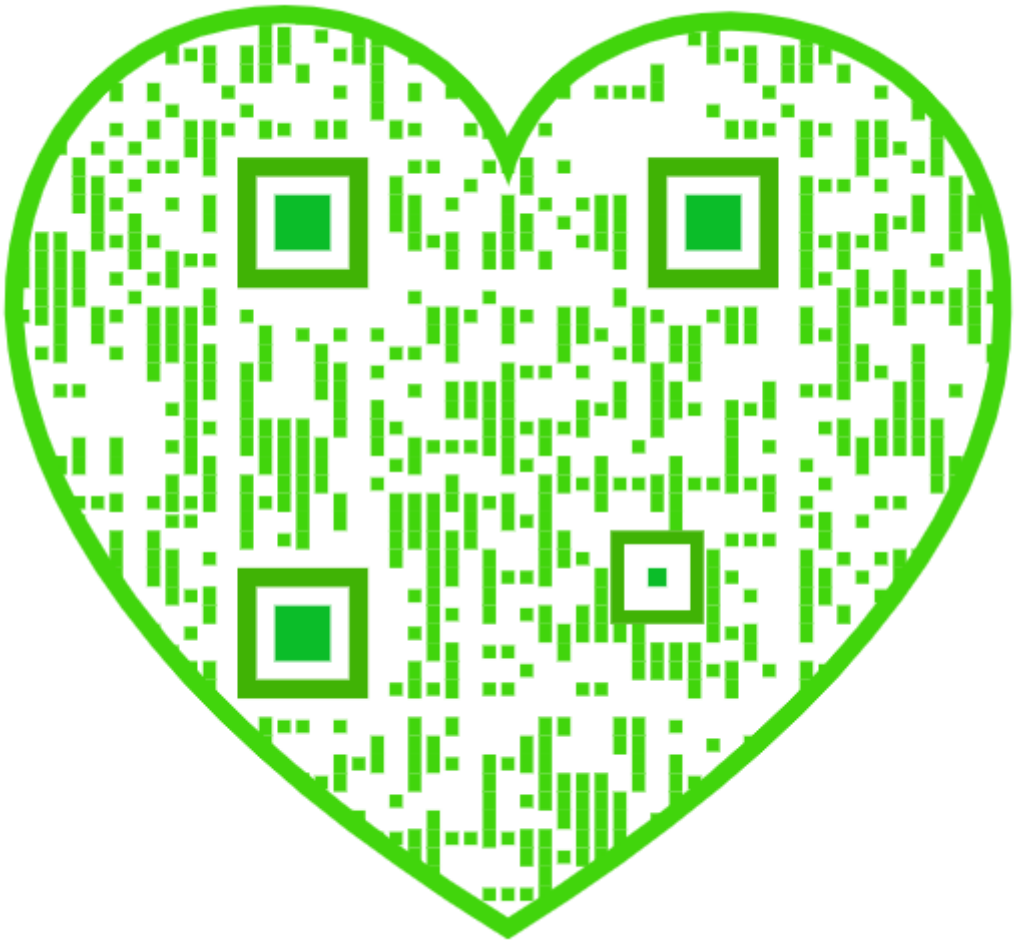

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THE ART CRITIC AND THE TALL BUILDING.

To say that the tall building is, architecturally considered, a monstrosity, is to give utterance to a commonplace which has of late become positively wearisome in its perpetual reiteration. It was pointed out years ago, when these structures were first put up, that a commercial building whose height was three or four times its base. and whose cornice towered some 300 feet above the curb, was a problem that was from a purely architectural point of view impossible of successful treatment. It was realized at the very outset that, inasmuch as the lofty building met an urgent economic condition and had come to stay, all that the architect could do was to mitigate its inherent ugliness to the best of his ability, and give its towering facade such treatment as would mercifully cloak, if it could not conceal, the staring abomination of glass, brick, and stone. Many of our architects have shown considerable skill in dealing with this, undoubtedly the most difficult problem of its kind in the history of the art.

In our recent article on the new Park Row building we presented the subject somewhat lengthily from an engineering and structural point of view, and dismissed the question of the architectural features of tall buildings with the following remark: "It cannot be denied that their exaggerated vertical proportions render it impossible to judge these buildings by the ordinary canons and pronounce them beautiful. The modern office building, however, is not to be judged by the usual architectural standards. It professes to be nothing more or less than what it is—a strictly utilitarian structure, admirably adapted to its purpose of housing the greatest possible number of business men upon a limited area in the city's busiest center." We naturally supposed that, having thus defined our position as to its architectural shortcomings, we might proceed to a discussion of the engineering and structural features of the building without any risk of being supposed to consider it an architectural embellishment of our curiously compounded city.

But we were mistaken. A recent edition of The New York Times surrenders three whole columns to its flamboyant and fantastically facetious art critic, who, being like Shakespeare's worthy evidently "graveled for lack of matter," takes up this old, old story of the tall building's ugliness, and labors to prove what all the world very well knows and by this time, surely, is utterly weary of being told. In this, of course, the art critic is entirely within his right. When, however, in the fervor of his imagination the writer goes on to misquote our article on the engineering features of the Park Row building as being full of "ecstasies of admiration" of its architectural beauty, he either willfully misrepresents or is incapable of understanding the point of view from which our article was written.

We are willing to believe that it is ignorance that has led him into error—the more so as we have rarely known the art critic, so called, to open his lips upon any great work of engineering, but what he has distinguished himself more by his assumption of superior knowledge than by his understanding of the true inwardness of the science.

We remember that when Wm. Morris, an art critic, we believe, who was an unimpeachable authority on carpet patterns, criticised the æsthetic features of that masterpiece of engineering, the Forth Bridge, Sir Benjamin Baker, the designer, replied that the question of the beauty of an engineering structure could only be intelligently passed upon by those who knew something of the meaning of the particular forms and proportions adopted for the structure. He suggested, incidentally, that while a classic column was an inimitable piece of work as it stood in the portico of the Parthenon, it would scarcely be beautiful if stood up on deck to do duty as the smokestack of a transatlantic liner! So with the tall building. It is the engineer's solution of one of the many economic problems that are forced upon us by the conditions of our crowded and complex modern life. It is the despair of the architect, for it is grossly and irredeemably utilitarian, from the shoe of its nethermost pile, 50 feet below ground, to the truck of its topmost flagpole from which the sacred flag of the country will do duty as the advertising agent of the exaggerated pile over which it floats. The raison d'etre of its existence is the necessity of accommodating a maximum number of people on a minimum plot of ground. The engineer-architect has been requested to work out this problem in the modern materials of construction at the least possible cost per pound and per foot; and he has done so, we venture to think, with the very best results that the hard conditions of the problem will allow.

To consume three columns of a daily journal in reviling these buildings as architectural abortions is to miss the mark entirely, and emphasizes the fact that even an art critic can be narrow in his outlook. The problem of the tall building is more one of engineering than architecture, and the structural features, as we have set them forth, are a subject which will always possess a positive interest for the intelligent reader. Sutor ne supra crepidam, says the old adage, "Let the cobbler stick to his last;" and, shall we add, "the art critic to his carpet patterns and bric-a-brac." There are some subjects which are to him a sealed book, and if he ventures to discuss them with that airy self-complacency with which his kind is apt to pass judgment upon any and all the works of God and man, we can only say to him, as someone said of old: "Sir, the well is deep, and thou hast nothing to draw with."

COMPRESSED AIR TRACTION IN NEW YORK CITY.

The rapidly growing interest in the development of self-propelled vehicles is resulting in a vast amount of experimental work in the effort to produce a satisfactory motor. Among the various forms of motive power that have been tested, compressed air has in the last two years shown very good results. To those who have not kept in touch with the subject, it may be surprising to learn that compressed air motors have been improved to such a degree that, in point of economy, they compare favorably with other and better known motors which of late years have been more in the public eye. During the earlier stages of the development of the steam locomotive, the attention of eminent engineers was directed to compressed air as possessing some excellent features for purposes of mechanical traction, and half a century ago the great Brunel, with characteristic boldness, equipped several miles of what is now the Great Western Railway, in England, with compressed air, building power stations and laying conduits between the rails. It was a failure, as were all the early attempts in this direction, chiefly because in the Great Western experiments, and those of later date, there was a great loss of power due to the unscientific methods of compressing and expanding the air in the compressors and motors. Brunel's system consisted of a pipe or conduit of compressed air laid between the rails and fed from central stations, and pistons, sliding within the pipe, which were attached to the cars by means of a plow in much the same way as the grips on our modern cable cars. The grips passed through a longitudinal slot on the top of the conduit, which was closed by leather strips which opened and closed to allow the passage of the plow. As was to be expected, the leather strips wore out and failed to close the conduit.

In this and in all the later attempts to use compressed air, however, there was a serious loss due to the fact that a large portion of the energy expended in compressing the air was transformed into heat, which subsequently was lost by radiation. Moreover, where the compressed air was utilized in motors, its expansion was accompanied by a reduction of temperature which produced accumulations of ice sufficient to choke the exhaust.

These difficulties have been overcome by better methods of compression (the work being done in successive stages with intermediate cooling) and by reheating the air prior to its introduction into the cylinders of the motor. During the past two or three years careful experimental work has been done in this direction on two of the leading street railways in New York city. On the One Hundred and Twenty-fifth Street line of the Third Avenue Railway Company several motor cars have been running which were constructed under the Hardie patents, and on the Lenox Avenue line of the Metropolitan Street Railway Company a thorough test has been made of the Hoadley & Knight compressed air motors. In both systems the air was carried in storage flasks, and was heated, by passing it through a tank of hot water, before being used in the cylinders. The Hardie motors were of the single expansion and the Hoadley of the compound type; and in the former the cylinders were direct connected to the axles, while the Hoadley cylinders were connected to a countershaft whose pinions engaged a gear wheel on the axle.

The compound system is said to have given the best results, and it has proved so satisfactory that the two companies have been consolidated into what is now known as the International Air Power Company. A large factory is being built adjacent to the present works of the American Air Power Company, and the company is now busy upon the new motors for operating several important cross-town lines in this city. At an early date the Twenty-eighth and Twenty-ninth Street lines will be in operation, and other main arteries of cross-town travel will be similarly equipped as soon as the motors can be built. It is expected ultimately to have the whole of the Metropolitan Company's great system under either electric or compressed air operation; the former being used on the great trunk lines, running north and south on the avenues, and the latter handling the cross-town and branch lines.

Contemporaneously with the consolidation of the Hardie and Hoadley interests in the International Company comes the announcement of the formation of the New York Autotruck Company, a companion concern to the former. The autotrucks are to use the Hoadley-Knight system, and they will be designed for handling the heavy trucking which is now entirely moved by horses. The press reports speak of the new autotruck as having in active service proved more economical than the horse. This is, we believe, a trifle premature, as the only actual motor thus far constructed is a rather crude affair used for carting material at the works which supply some of the compressing machinery.

As a competitor in the field of automobilism, compressed air will have to prove itself at least the equal of electricity, steam, gas, hot water storage, and other systems before it can hope to fulfill the promise of the promoters that it will remove the horse from the streets of this or any other city. If the motors do as well on the trucks as they have on the street cars, the autotruck may not only replace the horse, but prove to be the coming and abiding type for all forms of automobilism. This, however, has yet to be proved, and if the curiously named vehicles make their appearance on the streets of New York, their performance will be watched with no little interest.

Until, however, an experimental truck has been made and fully tested, and has proved that it can stand the test of actual and continued service in our city streets, it seems premature to expect the public to take very much interest in the extravagant notices which appear in the daily press, stating that a company has been formed with $10,000,000 of capital for exploiting these vehicles. It looks as if the autotruck should and probably will become an actuality, but its serviceableness for the purposes for which it is designed has yet to be proved.

THE BUSINESS OF THE PATENT OFFICE IN 1898.

The year 1898, which will ever be memorable as a year of victories, can also be looked upon complacently when the arts of peace are considered, for, notwithstanding the trying nature of the year, our export trade has been the most wonderful ever known, and only on one point have we fallen below the prosperity of former years. This is in the failure of the figures of the business of the Patent Office to show an increase. Indeed, the business of this important branch of the government service, which serves to protect industrial property, shows a falling off of 25 per cent in the applications filed. This is, of course, readily accounted for by the war, which turned the energies of many inventors into other channels and crippled the means of others to such an extent that the protection of a patent could not be obtained by them. In brief, the number of patents, designs, reissues, trade marks, labels, prints, and caveats filed in the last five years is as follows:

1893	43,020		
1894	43,161	Increase	141
1895	45,513	"	2,352
1896	48,353	"	2,840
1897	52,119	" ...	3,766
1898	39,663	Decrease....	12,456

The average number of applications for the years 1893–97 was 46,433, so that the applications in 1898 fell behind this average some 6,770. This decrease may at first seem appalling, but with the advent of peace and stable conditions in the business world, we do not doubt that in a short time the work of the Patent Office will be restored to normal and show a substantial increase.

The small number of applications, together with the special appropriation made by Congress, enabled the office to clear up the arrears of cases. Before the war there were 14,000 cases awaiting action, now there are only 5,000 in this condition, a gratifying advance. Such activity has naturally caused the number of patents issued to be large, compared with the smallness of the number of applications. In 1893 there were 23,769 patents, designs, and reissues; in 1894, 20,857; in 1895, 22,057; in 1896, 23,273; in 1897, 23,794; while in 1898 they only dropped to 22,267, the difference in the two last years being 1,527 patents issued against the loss of 12,456 in applications filed.

In still another branch of the operations of the Patent Office is a decrease; this is in the number of trade marks issued. In 1897, 1,946 trade mark applications were filed, 1,671 trade marks were issued; in 1898 there were 1,796 applications, but only 1,238 were issued. It will be seen that the war did not bear as heavily upon this branch of the business of the Patent Office, and the decrease in the number of trade marks issued may rather be laid to the very restrictive attitude which the Patent Office has assumed for some time past toward the registration of trade marks.

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PRINTING BY X RAYS.

Dr. Frederick Strange Kolle, in the last number of The Electrical Engineer, publishes a description of the "new process of printing by the use of X rays," which opens up what he claims to be a feasible method of producing an immense number of impressions or records. Dr. Kolle states that printing by the use of X rays was, perhaps, first suggested by an article by Elihu Thomson in 1896, wherein he showed that multiple radiographs had been made at one exposure; these were called multiple skiagraphs. The experiment proved that more than a single sheet of sensitized paper would be affected by the rays when laid one upon the other, setting aside the theory that the chemical composition of one sensitized film would absorb most of the rays. Owing to the thin sensitized films of the printing paper, very unsatisfactory skiagraphs were obtained. Dr. Kolle now declares that he has overcome these difficulties and that the process of typo-radiography is not a theoretical dream, but is a self-evident and systematic method of procedure. In regard to the practicability of this process, it may be said to overcome first the cost of labor of composition, secondly, the limited time of striking off copies, and thirdly, the advantage of keeping the entire work a total secret from the printer, a very valuable fact not to be overlooked in diplomatic documents, letters, communications, etc. Dr. Kolle finds a suitable writing ink for this purpose to be composed of red lead, powdered gum arabic, glycerine, and water. For type work a semifluid mixture of red lead, potassium bromide, and glycerine sufficient to make a paste would be necessary.

These inks will, however, only permit of white text on a black background unless certain photographic methods are followed, as in the employment of "upset developers," therefore, a second or "unfatty" ink, which will permit of black characters on a white background, must be used. These are made preferably of bichromated mucilage. Bichromated mucilage which has not been exposed to light previous to its use in order that its non-adherent property may be retained, is suggested for the writing. The fatty ink then applied with a roller will adhere to the unwritten portions of the paper, leaving the letters uncovered or free for the penetration of the X rays. The third method of preparing the phototype is to print or write a text with an adhesive or mucilaginous ink composed of a tacky varnish or gum and then dusting it over with some opaque metallic powder such as mercury biniodide, zinc oxide or lead oxide. The copy would then have to be blown off to render the characters clear cut and the unused space free from mottling opacities resulting from retained dust

After the copy is prepared, the sensitive paper on which it is to be printed is made into what Dr. Kolle calls a "senso-block" which contains fifty to one hundred sheets. It is then mounted or clamped into a form, the sensitized side upon which the copy or phototype is laid facing up, and it is thus subjected to the action of the X rays. The current is then turned on for an exposure of ten or twelve seconds, and the block taken to a dark room to be developed. Twenty blocks each containing fifty sheets of paper might be arranged around one X ray tube to give one thousand impressions every ten seconds of exposure. This would give about six thousand copies a minute. Prof. Kolle suggests that special gelatino-bromitized films be used and after being photographed to form a block should be made so that it will still retain the features of a single sheet.

The process is extremely interesting, and though it is not regarded as a menace to printing, at the same time there is, unquestionably, a field for the X ray printing establishment which may only require intelligent development to bring it within the domain of the working arts.

CIVIL ENGINEERS IN SESSION.

The forty-sixth annual meeting of the American Society of Civil Engineers was begun on January 18, at the Society's building, West Fifty-seventh Street, New York. President Alphonse Fteley occupied the chair. The meeting was for three days, and during it excursions were made to a number of interesting engineering works and establishments in the vicinity of New York. Mr. Willard Smith, of Chicago, who has been appointed to supervise the engineering exhibit from the United States at the Paris Exposition, spoke on that subject. He stated that 13,000 feet of the building already constructed had been given to the American exhibit in this department and that additional space would be found in the United States Weather Bureau Building. Mr. Smith recommended that there should be a plentiful exhibit of models, and he named, as among those which he thought would be of unusual interest and value, models of American cities. These show the real situation in reference to harbors, railways, plans of streets, intramural communication and in general the larger features of the city. Mr. Smith said one of the disadvantages in which the engineering products and achievements of the United States suffered is being comparatively remote from European countries. Hence the special value of the opportunity offered to Americans by an exhibition such as that at Paris. The course of action by the Society was referred to the Board of Directors.

THE PIRATES AND BRIGANDS OF THE PHILIPPINES.

BY SPECIAL CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

The brigands and pirates which infest the islands of the Philippines and the adjacent waters have, from time immemorial, been regarded as among the most desperate freebooters to be found in any part of the world. The inhabitants of these islands are composed of many different tribes and mixed races. The races or tribes are somewhat different on all the larger islands, and on every one of these there are tribes that never knew the rule of Spain. On these islands there are no less than seventeen pagan and half a dozen Mohammedan tribes. Luzon, Mindanao, Cebu, Negros, Mindoro, and a dozen other islands all have their lawless freebooters, the remnant of some native tribe.

To get a correct idea of the great bands of lawless natives who infest these islands, it will be necessary to go back to a date much earlier than the beginning of Spanish rule in these islands. Prior to the coming of Magellan, these islands had already suffered several foreign invasions. But these were peaceful ones. Away back in early ages, the Chinese or Inglotes sought these islands in great numbers, and their coming proved of much good to the islands. They had industrious ways and soon imprinted these upon these islands, Luzon in particular. Later, the Indian or Tagal invasion occurred, and these, like the Chinese, were soon absorbed in the population of these islands. Thus were made up the three early races in these islands, to which all tribes can be traced. These are the Negrote, Ingrote, and Tagal. The Negrote was the aboriginal race, and in many of the races the Negrote can yet be found. In nearly all cases the pirates and brigands are made up of these fierce tribes. The Tagal is, to-day, regarded as the real native of the Philippines. This tribe is the only one of the early races which, at this day, can be considered a factor in the islands.

Until a comparatively late day these islands have been the center of piracy. For more than three centuries Spain has been fighting to get rid of the pirates and subdue the native brigands, but without success; for many whole islands have practically always been independent of Spanish rule, while many tribes on the larger islands were also independent. On Luzon, Mindanao, Negros, Paney, Zebu, Leyte, Bohol, Samar, and Mindoro there are as many different tribes as there are islands.

In the earlier years of Spanish rule, the Tagals and Visayas gave the conquerors no end of trouble, and no sooner had these tribes been subdued than the Mores, in the south, began lawless operations. From that time to this, they have carried on their lawlessness, and have never been subdued. The Chinese pirates, in earlier days, also gave the Spanish much trouble. They captured a number of smaller towns along the coast, and even made attempts to capture Manila during the sixteenth and seventeenth centuries.

In the island of Sulu, Mohammedanism is particularly strong, and the sultans of the islands have, from time to time, given the Spanish rulers much trouble; but some years ago their power was broken. During the sixteenth century, the Mohammedan tribes were particularly strong on the islands of Mindanao, Palawan, Tawi Tawi, and Basilan. But the pirates of Mindanao have always been the most troublesome. The Mores still inhabit the islands, and live entirely independent of any outside rule.

The Mores are a peculiar tribe, which originally came from the surrounding islands and mixed with the native tribes of Mindanao. The Mores are the most warlike people of the islands and are a powerful race. They regard all foreigners as their enemies. This is probably due to the bad treatment they have received at the hands of the Spaniards. Most of the Mores are well organized and well equipped. The barong is a terrible weapon, and with it an expert tribesman can cut a man in half at a single blow.

The peculiar native crafts, so common on the rivers and harbors of these islands, are particularly adapted to the use of the pirates. They are long, narrow, and sharp at both ends and the natives are very skillful in handling them. They carry large sails and have outriggers to prevent the boat from capsizing. Before the days of steam navigation these crafts were easily able to avoid pursuing parties.

The brigands of these islands are no less notorious than the pirates, and while the latter are pursuing their lawless calling along the coast, the former are carrying on their system of plunder in the interior. Every island has its lawless tribes which never knew Spanish rule. These native brigands were in many cases led by the charm men, who, even to this day, are found among the native tribes.

Probably the most noted brigands of the islands are the Maccabebes, who are found on a number of the larger islands. The Maccabebes know no law save their own. They have no connection, whatever, with the insurgents, and natives and Spanish alike fall before this murderous gang. The Chinese are the particular mark of the Maccabebes, and scarcely a night passes but what some Chinaman is killed. Already our authorities have begun the work of breaking up the Maccabebes, and quite a number of the gang here in Manila have been executed. But this is only the beginning of the trouble with the wild tribes and the lawless bands of the Philippines.

THE GREAT STRENGTH OF BEARS.

The strength of grizzly bears is almost beyond belief, says a hunter, in Public Opinion. I have read about the powerful muscles in the arms of African gorillas, but none compared with those in the arms and shoulders of big grizzly bears. I have seen a grizzly bear with one forepaw shot into uselessness pull its own 1,100 pounds of meat and bone up precipices, and perform feats of muscle that trained athletes could not do. I have seen grizzly bears carrying the carcasses of pigs that must have weighed seventy pounds several miles across a mountain side to their lairs, and I have heard hunters tell of having seen cows knocked down as if by a thunderbolt with one blow from the forepaw of a bear. Three summers ago I spent the season in the coast mountains, near Hudson's Bay, and one moonlight night I saw a big grizzly bear in the act of carrying a dead cow home to her cub. I had a position on the mountain side where I could see every movement of the bear in the sparsely timbered valley below me. The creature carried the dead cow in her forepaws for at least three miles, across jagged, sharp rocks ten feet high, over fallen logs, around the rocky mountain sides, where even a jackass could not get a foothold, to a narrow trail up the steep mountain. She never stopped to rest a moment, but went right along. I followed, and just about half a mile from the beast's lair I laid her low. The heifer weighed at least 200 pounds and the bear about 450.

THE PROGRESS OF THE ZOOLOGICAL GARDEN.

The Board of Managers of the New York Zoological Society held their annual meeting on January 17. The chairman of the executive committee reported that $16,977 had been expended on the works for the installation of the animals at Bronx Park, work on thirteen structures being under way. These will cost, when completed, about $83,000.

One of the most important buildings which is now going up is the reptile house, which is, perhaps, the most perfect building for the purpose ever built. It is 145 × 100 feet, and will cost about $40,000. It presents an arched central hall, without columns, and it will include a crocodile pool, sand pile, and a conservatory of thick vegetation, and will provide room for the various serpents, saurians, frogs, turtles, lizards, etc.

The elk house is nearly finished, and excavations for some of the bear dens have been completed. Various other works have been carried on, such as the construction of duck ponds, with three islands, and a stone wall about the home of the prairie dogs. Excavations for the stone walls of the wolf and fox dens have also been made, as well as for the beaver pond and buffalo house.

DEATH OF THE LIBRARIAN OF CONGRESS.

Mr. John Russell Young, Librarian of Congress, died at his home in Washington, January 17, 1899. Mr. Young was born fifty-eight years ago, at Downington, Pa. When a young man he was employed on The Philadelphia Press, and served during the civil war as a correspondent in Virginia and afterward on the Red River expedition with General Banks. After the war he was connected with various newspapers in Philadelphia and New York, including the Tribune and Herald. In 1877 he accompanied Ex-President Grant on his trip around the world. He was Minister to China during 1882–1885. President McKinley appointed him to the office of the Librarian of Congress in the summer of 1897, to succeed Mr. A. R. Spofford, who became his assistant. Under Mr. Young's excellent executive management the library has proved much more valuable to readers than ever before.

BOSTON ELEVATED ROAD.

Ground has been finally broken on Boston's new elevated road, which will connect two widely separated districts, and, most important of all, unite the two new Union stations. The road will begin at Sullivan Square, in the Bunker Hill district, and will then proceed down Main Street, across the Charles River, until the North Union Station is reached. Then, after making a turn, will run along Atlantic Avenue and finally reach the new South Union Station, after which it will continue up Washington Street until Dudley Street is reached. The entire distance from Sullivan Square to Dudley Street, which is in the Roxbury district, will be about 10 miles. Of course the subway will really form a portion of the line. Electricity will be used as a motor power; a third rail will be used. Branch lines to other suburbs will be built later on. It is expected the work will be completed in about two years.

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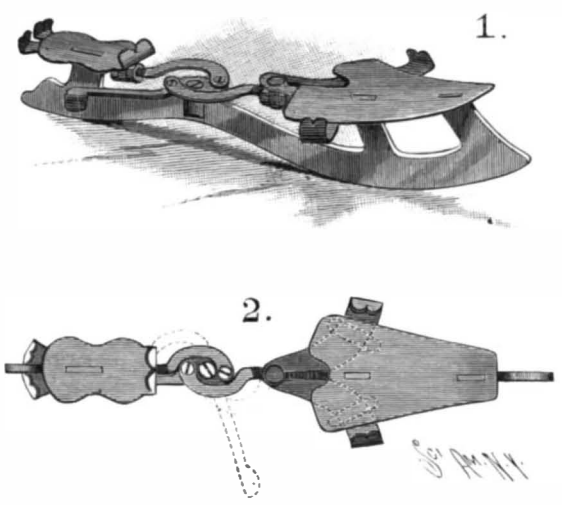
AN IMPROVEMENT IN ICE-SKATES.

In the accompanying illustration we present a skate which is provided with an improved lock for the heel and sole clamps, the lock being so constructed that either of the clamps may receive an initial or broad adjustment without disturbing the adjustment of the other clamp.

Fig. 1 is a perspective view of the skate, and Fig. 2 is a top plan view in which the clamps are shown in closed position by positive lines, and in open position by dotted lines.

The runner, in order to offer as little friction as possible, is arched, so that it bears on the ice only beneath the heel and sole plates.



FILOR'S IMPROVEMENT IN ICE-SKATES.

Upon the heel plate a clamp is held to slide, and upon the sole plate diverging clamps pivoted together at their rear ends are held to slide. Between the sole and heel clamps a lever is fulcrumed. Oppositely curved links pivoted to the lever, one at each side of the fulcrum, are adjustably connected by means of screw shanks with the sole and heel clamps. The pivotal connections between the links and the lever are out of alinement with the center of the fulcrum, so that when the curved portions of the links are brought close together by the movement of the lever, they will lock themselves in this position.

As each link is independently adjustable upon its clamp, the throw of the clamps may be separately regulated to change the locking action of the lever. The skate is the invention of Charles F. Filor, care of S. S. Moore, Trenton, N. J.

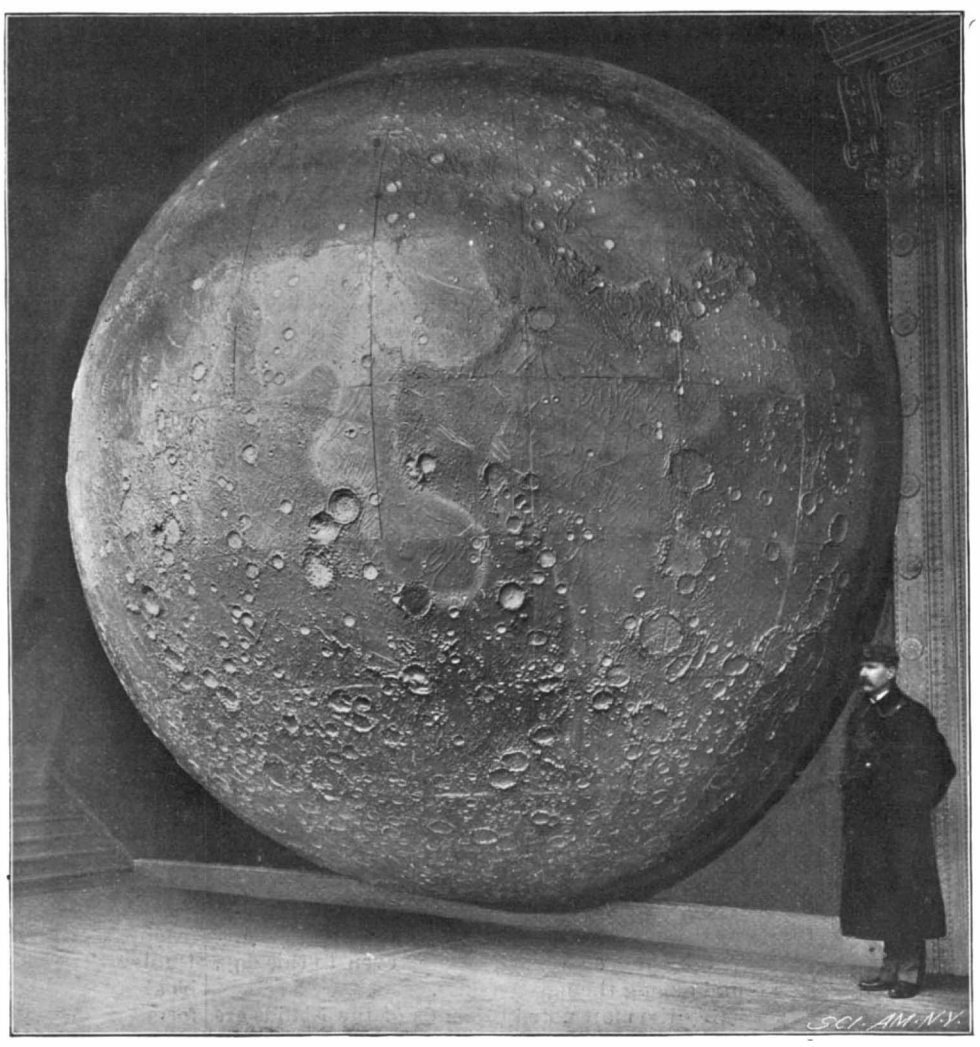
A GIGANTIC ARTIFICIAL MOON.

BY OLIVER C. FARRINGTON.

Under the above heading, the SCIENTIFIC AMERICAN of April 9, 1881, urged the attendance of its readers upon an exhibition at Steinway Hall, New York city, of a model of the moon 16 feet in diameter. The article closed by expressing the hope that the model might ultimately find a permanent abiding place in "some of our public institutions." After a lapse of nearly eighteen years, this wish has been realized, and the model is now permanently installed at the Field Columbian Museum, Chicago. Students of science, whether casual or professional, may well rejoice over the opportunity thus afforded them to become familiar with the physiography of the earth's satellite with but a tithe of the labor and equipment required to study it by means of a telescope. What was said of the model by the SCIENTIFIC AMERICAN then is true still: "It is by far the largest, most elaborate, and expensive portrait of the moon ever made, and, seeing that it was constructed for and under the immediate direction of one of the most eminent selenographers, Dr. Schmidt, Director of the Observatory at Athens, Greece, we may safely accept it as a faithful portrait." The model is a hemisphere 19·2, not 16 feet in diameter. It is made up of 116 sections, 15° in length by 15° in breadth, which serve to mark upon the surface parallels and meridians. The horizontal scale is 1 : 600,000, the vertical 1 : 200,000. The elevations are therefore exaggerated but three times, a much smaller increase than is usually necessary to bring out features of detail on relief maps of the earth's surface. By means of this scale the various features of the moon's surface have been accurately and vividly portrayed. The extraordinary volcanic activity which our satellite has undergone impresses one at the first glance, while the mountains, plains, cliffs, and chasms, surpassing in grandeur anything to be found upon the earth, are vividly shown.

Here, for instance, are Copernicus with its vast crater 46 miles in diameter, its interior marked by terraces formed by huge landslips which took place along the mighty ramparts; here are the awful chasms, a mile wide and 100 miles long, radiating from Triesnecker; the magnificent group of Theophilus, Cyrillus and Catharina, with craters 60 and 65 miles in diameter merging into one another; the walled plain Schickard, 153 miles in diameter, with ramparts several miles in height; the "thin cheese" of Wargentin, apparently a crater that has been filled with lava to the brim which remains in place cold and hard; the mighty "seas" of Oceanus Procellarum and Mare Crisium, which are in reality vast plains, covering areas of 90,000 and 78,000 square miles; and all the other objects to the number of twenty thousand, which it has been the labor of astronomers from the earliest times to measure and describe. Later discoveries are not likely to add much detail necessary to the completeness of such a model, for the features sufficiently large to be shown by it have been agreed upon by astronomers for many years. The impression gained of the condition of the moon's surface by looking at the model is that it is a scene of utter desolation and ruin—a globe without life or comfort for beings such as man. This is undoubtedly what one would find could he make a trip to the moon itself, and a view of this model is perhaps the best substitute for such a journey which has yet been devised.

Mr. Lewis Reese, of Chicago, was the donor of the model to the Museum.



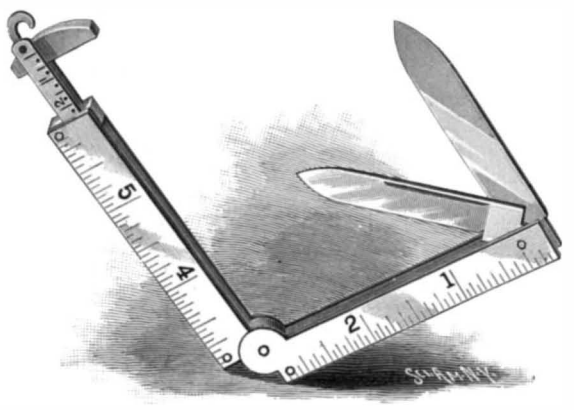
MODEL OF THE MOON NINETEEN FEET IN DIAMETER RECENTLY INSTALLED IN THE FIELD COLUMBIAN MUSEUM.

Cloth from Pineapple Fiber.

In an article on "Possible Fiber Industries of the United States," in Appleton's Popular Science Monthly (November, 1898), C. R. Dodge tells us the leaf of the pineapple contains a very fine silky fiber that may be utilized in the manufacture of textile fabrics. He says: "A pineapple plant matures but one apple in a season, and after the harvest of fruit the old leaves are of no further use to the plant, and may be removed. The leaves have the same structural system as the agaves—that is, they are composed of a cellular mass through which the fibers extend, and when the epidermis and pulpy matter are eliminated the residue is a soft silk-like filament, the value of which has long been recognized. Only fifty pounds of this fiber can be obtained from a ton of leaves, but, as the product would doubtless command double the price of Sisal hemp, its production would be profitable. How to secure this fiber cheaply is the problem. The Sisal hemp machines are too rough in action for so fine a fiber, and, at the rate of ten leaves to the pound, working up a ton of the material would mean the handling of over twenty thousand leaves to secure perhaps three dollars' worth of the commercial product. Were the fiber utilized in the arts, however, and its place established, it would compete in a measure with flax as a spinning fiber, for its filaments are divisible to the ten-thousandth of an inch. The substance has already been utilized to a slight extent in Eastern countries (being hand-prepared) in the manufacture of costly, filmy, cobweb-like fabrics that will almost float in air."

A COMBINATION-TOOL.

An ingenious combination-tool has been invented by Beniamino Ibelli, 139 Hudson Avenue, Brooklyn, New York city, which comprises essentially a rule, a penknife, a gage, and a weighing-scale.



IBELLI'S COMBINATION-TOOL.

Referring to the annexed illustration, it will be seen that the tool consists of a rule formed in two sections, hinged together, each section being recessed at one side. Within the recess of the first section and between the side walls are pivoted two knife-blades, the backs of which are adapted to be received by the recess of the second section when the tool is folded and the blades are closed.

Behind the rear-wall of the recess in the second section, a chamber is formed, which receives the graduated bar of a weighing-scale, controlled by a retractile spring. On one of the outer surfaces of the section a gage is adapted to slide in guideways, and is designed accurately to caliper shorter diameters when the two rule-sections are closed.

Kitchen Bacteriology.

According to The Dietetic and Hygienic Gazette, a Königsberg doctor, Privat-docent Dr. Jäger, recently gave a course of hygiene and bacteriology for ladies, which included practical exercises in applied bacteriology, for instance, in the preparation and preservation of food by methods used in bacteriological work. At the close of the lectures the hearers were allowed to invite their friends to an exhibition of kitchen products — some raw and some cooked—that had remained in a warm room for periods varying from five to sixteen days, and which were all found perfectly fresh and quite unchanged in appearance and taste. Nor had any complicated procedure been required to obtain this result.

The method simply consisted in: 1. The use of vessels with well-fitting, overlapping lids, instead of the inside lids used in kitchens the world over, which allow stray bits of matter that may adhere to their rim to fall into the food. 2. Avoidance of opening the vessels in which the food was kept, or, where this was indispensable, careful manipulation as in bacteriological work. 3. The use of cotton wool as a covering. Cotton-wool lids had been specially prepared to fit the wide tops of the food vessels; they consisted of a circular disk of cotton wool, tightly held between two metal rings, the outer of which formed the overlapping rim of the lid. The Gazette says that it is to be hoped that Dr. Jäger will find imitators, and that "kitchen bacteriology" may become a study with ladies. Certainly there is much room for improvement in the old-fashioned kitchen methods to which our "family plain cooks" cling with such desperate energy, and which they seem to regard with an almost superstitious reverence.

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The Progress of the Trans-Siberian Railway.

For a long distance toward the Pacific Ocean it is expected to lay the rails of the Trans-Siberian Railway at the rate of four miles per day. The road is now being built without foreign employes, except for a number of Italian stone cutters. The rails are being turned out by subsidized Siberian foundries. Every seven miles a side track is being built, so that the entire route may be cleared for military trains, should it become necessary. A train de luxe now runs once a week from Moscow as far east as Tomsk. From that point a second-class passenger train runs three times a week as far as Irkutsk. The cost of a second-class ticket from Moscow to Lake Baikal, where the government is now laying rails, is about $40, and the journey lasts some twelve days.

AN IMPROVED WOOD-WORKING MACHINE.

A machine for doing a variety of work is a necessity in any factory where there is not a full line of machinery, and the universal wood-worker, which has just been redesigned and patented by the Egan Company, Nos. 327 to 347 West Front Street, Cincinnati, O., is well adapted to meet the various requirements of the wood-worker. The machine will make glue-joints, will chamfer, tongue, and groove, raise panels, miter, rabbet, flute, and bead.

The column is cored out, cast in one piece, and is heavily braced. The connected and movable bearings are laterally adjustable across the machine in square gibbed slides. When the operator has his fence set for doing work, he can adjust the head with the greatest rapidity to the exact line desired.

The spindle has an outside bearing which can be instantly removed by loosening one hand bolt, to give free access to the head. All cutter-heads used are adapted to run at the highest speed.

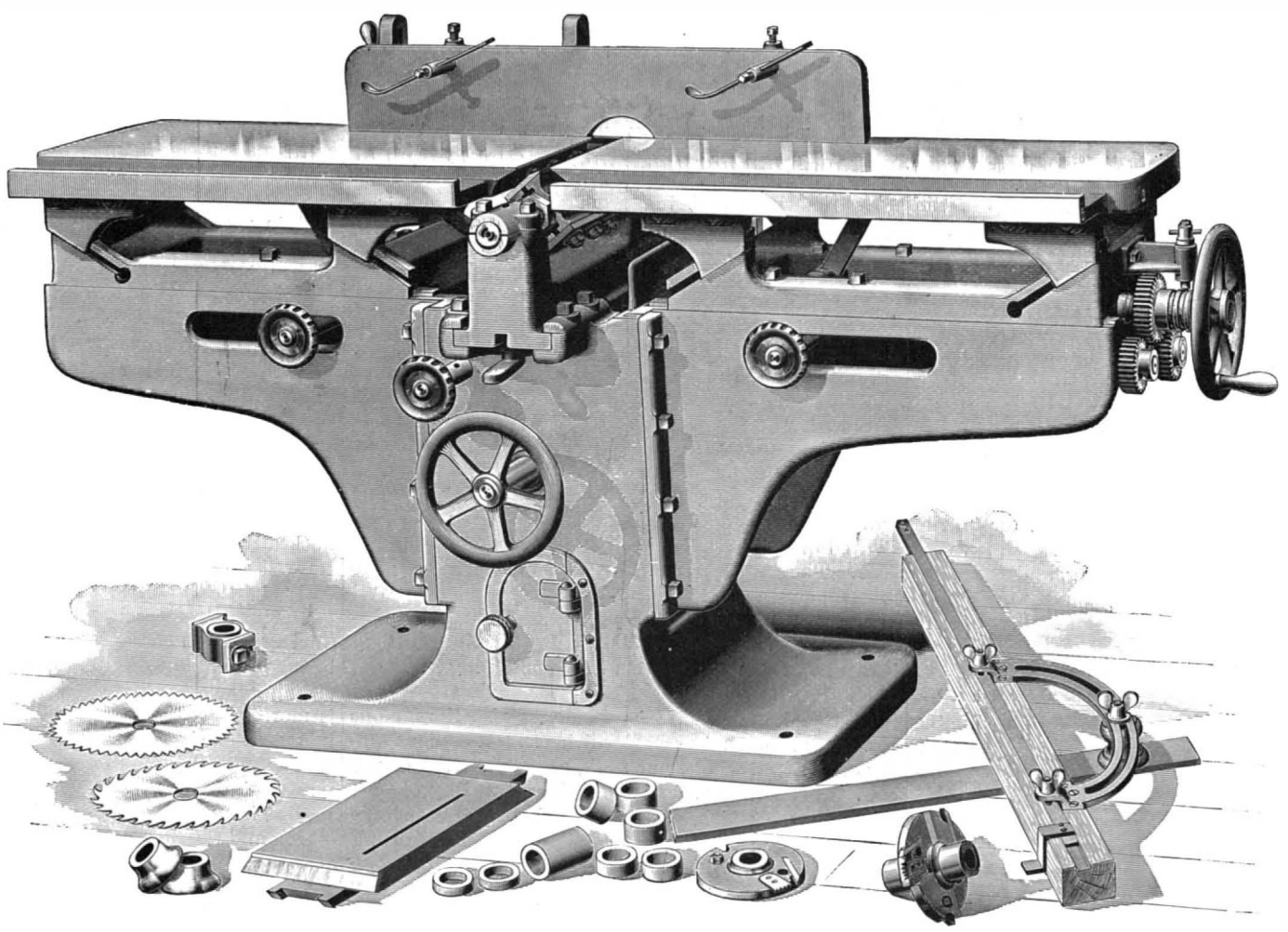
Both tables may be adjusted vertically, horizontally, and to the circle of the head independently, or may be drawn clear back from the cutter-head, to give free access to the mandrel in order to put on any cutters, heads, or saws, by means of the hand wheel at the working end of the machine. Both tables may be raised and lowered together, following the circle of the head. By the large hand wheel at the front both tables may be raised and lowered together vertically. The relative positions of the tables are not changed, and the adjustment is accomplished in either instance by means of a single hand wheel. There are four inclines to each table, one at each corner, so arranged that all wear may be taken up and the tables always kept in perfect alinement, notwithstanding any wear that may take place.

For panel-raising, two panel-heads, with a special fence, are used. Both sides of any door-panel of any shape can be raised at the same time.

An adjustable bevel-fence is provided which can be set to any angle desired by loosening one clamp bolt, and which has a free movement across the table for the different kinds of work to be done. The face of this fence is planed perfectly true.

The boring side can be used for all kinds of boring or routing. The table is raised and lowered independently by the cranks shown in the cut. A fence for angle boring is fitted on the table. with stops for spacing the holes and routing.

The Egan Company's wood-worker was awarded a medal at the Cincinnati Industrial Exposition October 3, 1882; October 6, 1883; at the Cincinnati Centennial Exposition, 1888; at the World's Fair, Chicago, 1893; at Antwerp, Belgium, 1893; and at Santiago, Chile, 1894, for convenience of adjustment and originality of construction and the trustworthy and thorough workmanship displayed throughout.

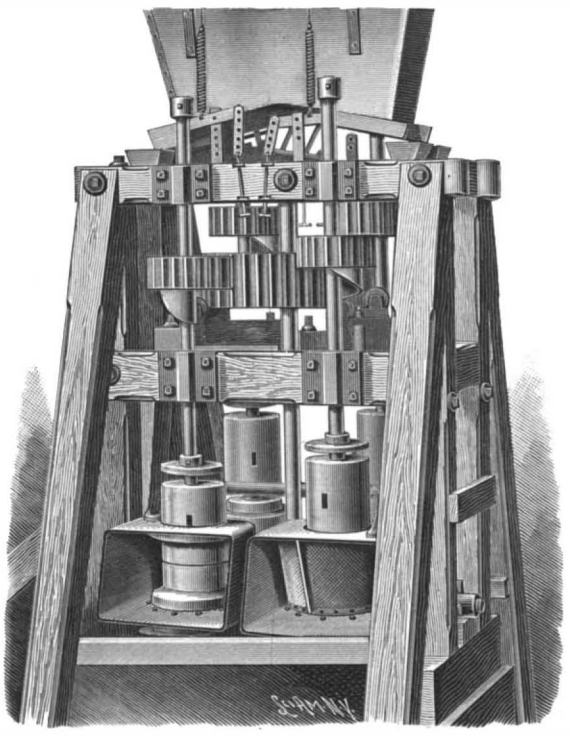


PLANING AND JOINTING SIDE OF AN IMPROVED WOOD-WORKING MACHINE.

A ROTARY ORE-STAMPING MILL.

In many of the gravity ore stamping mills no small percentage of values is lost in slime. Moreover, these mills are provided with stamps having only reciprocating motion. In the mill which forms the subject of the accompanying engraving the slime losses are considerably reduced, and the stamps are moved not only vertically, but are also rotated.

Mounted in the lower portion of a heavy frame is a horizontal shaft, driven in any desired manner, and geared to a vertical shaft extending upwardly to the top of the casing. At its upper end the vertical shaft is provided with a wide-faced cog-wheel meshing with four other cog-wheels provided on their under surfaces with cams adapted to engage rollers. The four cog-wheels are carried by vertical shafts having iron plungers or stamps at their lower ends. These stamps have chilled iron shoes and move vertically within crushing shells resting upon cast iron bases recessed to receive chilled iron dies. A wire screen, funnel-shaped in form, is fitted within each crushing shell. The ore crushed by the stamps will be gradually forced through the screens when it has been reduced to the requisite degree of fineness.



PARKER'S ROTARY ORE-STAMPING MILL.

As the cog-wheel driven by the central shaft revolves, the stamp shafts will be rotated by their cog-wheels, and will rise and fall as the cams respectively engage and pass over the rollers. It is, therefore, evident that the stamps are enabled not only to crush, but also to grind the ore, by reason of the movement of rotation imparted by the cog-wheels.

The inventor of this mill, Mr. A. A. Parker, of Ridgway, Col., informs us that his apparatus has been used with gratifying results. A battery of four stamps driven by a ten horse power engine, it is said, will crush twenty-five tons of ore in twenty-four hours with screens of sixty-mesh fineness.

American Capital in Brazil.

An article on the resources of Brazil, written by L. Lipman, a prominent local authority, at the request of Consul-General Seiger, at Rio Janeiro, has been published by the Department of State. Supplementing the writer's observations, Consul-General Seiger says:

"I regard with much favor the proposition of organizing an American syndicate for business operations in Brazil. While the present financial and commercial depression is unfavorable to new industrial ventures and to rapid increase in the sale of American merchandise in Brazil, it offers, on the other hand, excellent opportunities for the investment of capital in industrial enterprises already established on terms much more favorable than could be obtained when the country is once more placed on a solid financial basis.

"European capitalists, especially British, are for these reasons making investments here. American capitalists ought to combine to send financial and technical experts to this country, men of experience and mature judgment, who speak the French and Portuguese languages, and let them look around in Rio, in Minas Geraes, in Parana, in Santa Catharina and Rio Grande do Sul. There is no lack of opportunity for good investments. This is also a good time for the preparatory work that may lead to permanent commercial relations at the time of a general trade revival, which is sure to come sooner or later.

"A great deal of harm has been done lately by adventurers who come here from the United States with a great flourish of trumpets, but without any means, experience or knowledge of French or Portuguese. They bring a great variety of 'samples' (easily convertible into cash) from manufacturers anxious to extend their trade in Brazil. Such unscrupulous and ill-prepared agents can only harm American prestige in this market.

"I would advise our export associations to quit sending circulars here, which are never read, and to establish a monthly American trade paper in Rio, printed in the Portuguese language. Such a paper could easily be made self-sustaining, and, if properly conducted, would pave the way to closer business relations between the United States and Brazil.

"A profitable business might be done in the shipment of Brazilian hard woods to the United States. This business is at present, so far as my observation goes, almost exclusively confined to rosewood; but there are many other fine cabinet woods in Brazil, some of which are much cheaper and even more beautiful.

"Lately the immigration into Brazil has fallen off very considerably, that of Teutonic and Anglo-Saxon origin having almost entirely ceased. This fact is due to the extremely hard times now prevailing in Brazil and also to the fact that the national government, as well as the state governments in the south, are at present financially unable to grant substantial assistance to immigrants.

"The overproduction of coffee is now forcing the Brazilian agriculturists to diversify agriculture so as to produce the foodstuffs necessary for home consumption." In this connection Mr. Seiger gives the figures of the crop for 1897-98 at about 11,000,000 bags of 132 pounds each, while that for 1898-99 is estimated at from 7,000,000 to 9,000,000 bags.

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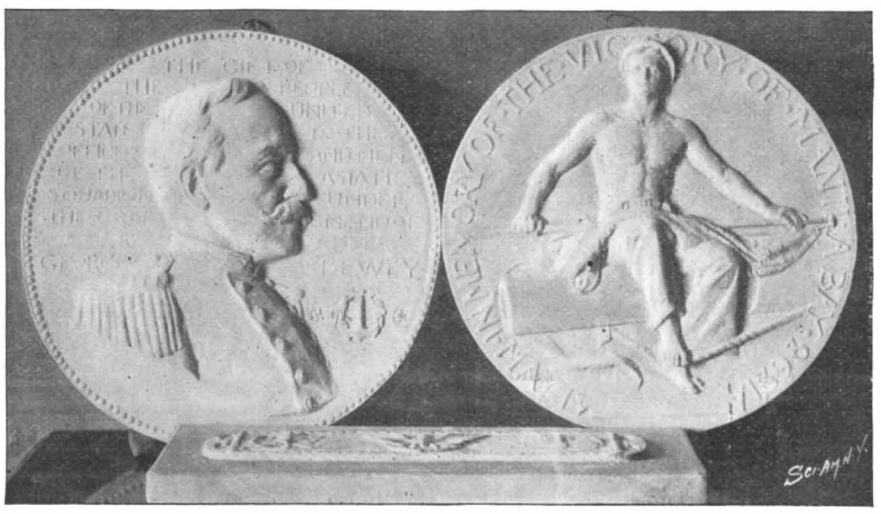
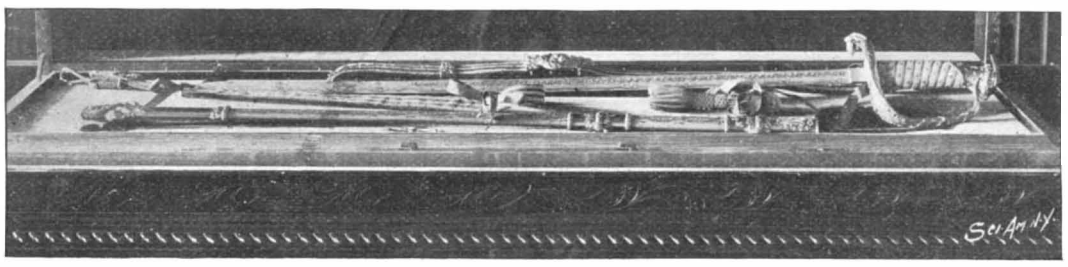
RECOGNITION OF REAR-ADMIRAL DEWEY.

As soon as possible after the news of the splendid victory of Commodore Dewey at Manila Bay, on May 1, reached the United States, it was determined by Congress that the hero of this great naval engagement should receive in substantial form a token of appreciation from the nation, and on June 3, 1898, by a joint resolution of Congress, a sword of honor was ordered to be presented to Rear-Admiral Dewey, and, in response to the resolution, a number of designs were submitted. A representative committee, composed of Assistant Secretary of the Navy Charles H. Allen, Hon. Henry Cabot Lodge, United States Senator from Massachusetts, and Prof. Marshal Oliver, of the United States Naval Academy, selected the design, the one chosen being that of Mr. Paulding Farnham, the secretary and one of the directors of Tiffany & Company, the well-known jewelers of New York, who is an excellent designer and sculptor as well.

The sword is one of the finest and most costly testimonials of the kind which has ever been presented. With the exception of the steel blade and the metal body of the scabbard, it is made entirely of pure twenty-two carat gold. The grip of the sword is covered with fine sharkskin, which is held in place by gold wire and is studded with gold stars. Above the grip the handle terminates in an elaborately chased and enameled gold collar and pommel, a narrow band of oak leaves uniting the collar to the grip. On the pommel is carved the name of the battleship "Olympia" and the zodiacal sign for the month of December, which is Commodore Dewey's natal month. These are encircled by a closely woven wreath of oak leaves, which are the standard decoration for a naval officer of Dewey's rank. At the very top of the hilt are the arms of the United States, the blue field of the shield being in enamel. Below them are the arms of Vermont, the native State of the Rear-Admiral. The guard is composed of a conventional eagle terminating in a claw clasping the top, and the outspread wings form the guard proper. The eagle holds a laurel wreath in the beak. This, besides being symbolical, serves as a protection, covering the point of the beak. The sword blade is of the finest steel and is damascened with the inscription which should be honor enough for any man. It reads: "The gift of the nation to Rear-Admiral George Dewey, U. S. N. in memory of the victory of Manila Bay, May 1st, 1898." The blade is ornamented with Phœnician galleys, and on the reverse of the lettered side are shown eagles in flight—symbolic of victory. The scabbard is of thin steel and is damascened in gold, with sprays of a delicate sea plant, which signifies fidelity, constancy, and remembrance. The sprays are interlaced so as to form, as it were, a series of cartouches with stars in the center. At each side of the bottom of each cartouche is a dolphin. The lower portion of the scabbard terminates in entwined gold dolphins. Sprays of oak leaves and acorns secure the rings and trappings of the scabbard. The top of the scabbard is terminated by a raised monogram in diamonds, with the letters "G. D.," which are entwined, and below them are the letters "U. S. N." This eminently appropriate testimonial to the great sailor cost $3,000.



MEDAL COMMEMORATING THE VICTORY OF MANILA BAY.



SWORD PRESENTED BY THE NATION TO REAR-ADMIRAL GEORGE DEWEY.

We also illustrate the handsome medal which has been struck in honor of the victory. It was designed by Mr. Daniel Chester French, the well-known sculptor, and is made of bronze. The obverse has a medallion portrait of Rear-Admiral Dewey and bears the words, "The gift of the people of the United States to the officers and men of the Asiatic Squadron under the command of George Dewey." The center of the reverse is occupied by a gunner naked to the waist, who sits on a gun, holding an American flag, and around it are the words, "In memory of the victory of Manila Bay, May 1, 1898." The rear-admiral and all his officers and men will receive these medals.

The Dangers of the "Dry-cleaning Process."

The extreme care with which easily inflammable liquids should be handled was exemplified some time ago in the case of a paraffin hair-wash. This unfortunate occurrence, which resulted in the death of a lady from shock and burns, would appear to have been due to the ignition of benzine by the production by friction of an electric spark. It is well known that when the air is particularly dry the production of an electric spark, say by stroking the hair or by rubbing flannel, is a very simple matter. Under the very dry conditions of the atmosphere there is a strong tendency for opposite electrical conditions to exist on the slightest provocation. This probably accounts for a somewhat remarkable accident which occurred in a "dry-cleaning room" at Ashton, England. Some workmen were engaged in cleaning by the dry process certain garments, such as pants and vests. During the rinsing process a flash suddenly occurred in the "rinse kettle." "It was a bright flash like lightning. Then everything became one mass of flame, the spirit, garments, and everything." The fire extended, and one man unfortunately lost his life. The witnesses were one and all positive that the flame had its origin in the "rinse kettle," and every precaution was taken to exclude any possibility of ignition from naked flames or from lighted tobacco pipes. The igniting cause was probably, therefore, an electrical phenomenon, and it only remains to suggest that when the weather is remarkably dry the air in dry-cleaning workshops should be kept moist by suitable means, and extra care should be taken to avoid friction in the cleaning process.

Bread Fruit Trees.

Of the various trees that produce fruit which is used as a staple article of food by man may be mentioned those of the genus Artocarpus (a word meaning "bread fruit") of tropical countries.

The bread fruit tree (Artocarpus incisa) of the southern part of Asia and the South Sea Islands bears a roundish fruit of the size of a melon, rough on the exterior, marked with hexagonal knobs, and of a green color. The pulp of the interior is whitish and of the consistence of new bread. It is roasted before it is eaten, but has little flavor. The best varieties contain no seeds, the tree being propagated by shoots that spring from the roots.

In the South Sea Islands the bread fruit constitutes the principal article of diet of the inhabitants. It is prepared by baking it in an oven heated by hot stones. The plant is now cultivated in the West Indies, but does not there equal the plantain as an article of food.

The fruit of the bedo, another plant of the genus, contains two large pulpy seeds that swim in a semi-liquid substance of a vinous taste. It, therefore, offers the natives of Java and the Marianne and Philippine Islands, where the tree grows, both food and drink.

The jack (Artocarpus integrifolia), another bread fruit, is a native of the Indian Archipelago and is cultivated in Southern India and all the warm parts of Asia. The fruit is a favorite article of food among the natives, as are also the roasted seeds.

The roasted nuts of Brosimum alicastrum, a tree belonging to the same order as the Artocarpus, are used instead of bread, and have a taste something like that of chestnuts.

To this last named genus belongs also the famous cow tree of South America, which yields a copious supply of rich and wholesome milk, as good as that of the cow. In the same order we find the genus Phytocrene, one species of which, when wounded, discharges a large supply of pure and wholesome liquid, which is drunk by the natives. By a singular anomaly, the order of plants that includes these useful trees embraces the celebrated upas tree, which, when pierced, exudes a milky juice which contains a very acrid and virulent poison into which the natives of Java dip their arrows.

Uranium.

Uranium is obtained chiefly from the mineral pitchblende, an oxide of uranium, but generally contains small quantities of other metals, as the following results of the analysis of a typical specimen show:

	Per cent.
Oxide of uranium	79·15
Lead	6·20
Silica	5·30
Iron	3·03
Lime	2·81
Arsenic	1·13
Magnesia	0·46
Bismuth	0·65
Water, Selenium, Manganese, Carbon	1·27
Total	100·00

It is now prepared by calcining uranium nitrate in a porcelain crucible until a reddish-colored mixture of the sesquioxide and green oxide (W_3O_4) is formed. The mixed oxides are thoroughly ground with a slight excess of pulverized charcoal and tightly packed in a carbon crucible. On subjecting the charged crucible to an electric current of about 450 amperes and 60 volts, the reduction is completed in a few minutes. The metal thus obtained is not pure, but contains carbon in amounts which vary between 5 per cent and 14 per cent. This carbide has a brilliant fracture and great hardness, and when thrown on a slab of porcelain, or closely pulverized and shaken in a glass flask, exhibits the singular property of discharging copious showers of sparks, resembling those displayed when freshly reduced iron is quickly moved about in air. The fusing point of uranium carbide is very high—much higher than that of platinum—and the alloy will probably be found to possess advantages over platinum for use in pyrometers and similar instruments. Carbide of uranium would make a splendid alloy with steel, and if it could be obtained cheaply it would probably supersede nickel and wolfram in the manufacture of high-class steel.

Pure uranium is a perfectly white, non-magnetic metal which takes a good polish, and can be easily scratched with a file. When subjected to high temperature, it is much more volatile than iron. Finely powdered uranium takes fire in an atmosphere of fluorine, and is attacked by chlorine, bromine, and iodine at different high temperatures. It is also completely burnt in an atmosphere of oxygen at a temperature of 170° C. At high temperatures uranium directly combines with nitrogen.

An alloy of uranium and a small quantity of silver, copper, or lead is used in the manufacture of a yellow glass which arrests chemically active light rays. It is employed in making windows for chemical laboratories and photographic developing rooms, and for bottles and flasks for holding substances sensitive to light. The salts of uranium are largely used in photography and as chemical reagents. Some of them are used in glass painting for making apple-green tints, and in porcelain painting for producing black tints. Recent researches in chemistry and physics have made us familiar with the properties of a number of new or rare metals, but few of them possess so many valuable properties as uranium, and it is to be regretted it is so sparingly and irregularly distributed.—Mining and Scientific Press.

Rice Cultivation in Russia.

While rice has long been grown in Persia and the Trans-Caucasus, it was almost unknown in the interior of Russia up to 1886, the supply being imported from India, and, as it was subjected to high duty, its use was naturally confined to the wealthier classes.

Russia first commenced the cultivation of rice in the early eighties, and in 1888 the first steam rice-cleaning factory was opened at Baku, and 1,612 tons were produced the first year. There has been a steady increase in the production of rice, and there are now five rice-cleaning factories in operation and the annual product is more than 48,000 tons. The demand for rice has increased and it is now generally used by the peasants throughout the empire. The quality of the native product is equal to that of the imported article. The residue is utilized, the broken grain being made into starch and the flour is given to hogs.

The Havana Electric Company.

A company with a capital of $5,000,000 has been formed to operate street railways through the city of Havana and elsewhere in Cuba.

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Correspondence.

Tregaron Bogs.

To the Editor of the SCIENTIFIC AMERICAN:

Some years ago I saw in the SCIENTIFIC AMERICAN articles on the working of peat bogs in Germany, I believe ten or twelve years ago, and since then I have been endeavoring to bring these bogs of several thousand acres before the commercial world, and lately some German chemists have been here experimenting, with very satisfactory results. One of them, Mr. Sprayborn, has obtained a patent on his process. His mode of working it is by distilling the wet peat. A certain weight is put in a retort, some chemicals being previously mixed with the wet peat, about 5 ounces to every 112 pounds, and the different oils are abstracted, leaving nearly pure carbon in the retort, which is then put into a mould and compressed and comes out a solid briquette; and they maintain that these briquettes will burn equal to coal with very little smoke and only two or three per cent of ashes, and which they can sell at 6 shillings per ton. They reckon that they can obtain from 40 to 50 gallons of refined oils from each ton of wet peat. On one trial at which I was present they put 70 pounds of peat in retort, obtained over 6 gallons of crude oils, some of the light oils escaping, and there was only 8 pounds of carbon left. The oils obtained are lubricating oils, naphtha, camphor, ammonia, paraffin wax and tar. The proportions of each I do not know, and there are one or two by-products, besides the peat, which is from 25 to 30 feet deep. There is fine clay from 15 to 18 feet thick, which will make good earthenware and bricks, and both can be baked by the turf briquettes, the ashes being used for mixing with the clay for the coarser bricks. T. W. JONES.

Tregaron, South Wales.

A Chinese Typewriter.

To the Editor of the SCIENTIFIC AMERICAN:

The interesting article on typewriters in your number of August 13 would have been more complete had the writer known that there was a machine for writing Chinese. He was correct in assuming that the entire bulk of the written language, some 14,000 characters more or less, is too large a dose for any machine with which we are acquainted, but, as the most of these are rarely used, one can get on with a much smaller number; in fact, about 4,000 make a very comfortable vocabulary, and can express quite a range of ideas.

A machine writing about this number of characters has been invented by Rev. D. J. Sheffield D.D., president of the North China College, A. B. C. F. M.

The only specimen as yet existing is the one made to his order, by an American firm, and in constant use at the college at Tungchow, near Pekin.

The mechanism is peculiar; the characters defy analysis in any way to make possible building them up piecemeal, so a keyboard is out of the question. They are arranged on the face of a stereotyped wheel, about 2 feet in diameter, in radii of the circle. The wheel is mounted horizontally, type face downward, while homologous printed characters on the upper surface serve to locate them. The radius carrying the desired character must be brought into the printing line. A simple link motion finder brings the paper to the right place, and a lever below presses it up against the type.

The machine is marvelously compact and simple, considering the large number of ideographs which it must carry. One fairly expert with it can write four or five times as fast as a very rapid writer with the brush pen.

In the ordinary course of Chinese business, either governmental or mercantile, this dispatch would not commend itself particularly, and, in fact, would arouse strong opposition, as depriving a very worthy class of people of employment, but the impact of the occidental has a tendency to "hustle" the East. And in the railroad business, which is beginning to assume tangible proportions, there is a call for celerity which is likely to demand more of these ingenious typewriters. You, sir, have doubtless followed somewhat the course of political events in China, during the last few exciting months, and know how the young Emperor Kwang Hsii, after developing a wonderful eagerness for the improvement of his country, through the introduction of western learning and methods, has been dethroned by a coup d'etat, imprisoned by the Empress Dowager, who was regent during his minority, and compelled to petition her to assume the prerogatives of sovereign, which she has done, while he is held in durance at her palace in Eho Park. His trusted advisers, who were working for enlightenment and progress, are beheaded, banished, or fled, and almost all his reform measures are reversed. Among them was the establishment of a bureau for the encouragement and protection of inventors, and he began a system which practically initiated a patent law for the empire, giving a monopoly of the manufacture of worthy inventions.

This has gone with the rest, and recently a local mechanic at Foo Chow, who had invented a spinning machine, which, before the coup d'etat, had been recognized by the viceroy of his province, and for which he had been given the privilege of sole manufacture and sale, applied for a passport to the provincial judge, that he might exhibit his invention in the interior of the province. To his great surprise, however, the judge refused the petition, describing inventions as a fraud and patents as a means of tempting deluded people to desert the good old ancestral ways.

A. P. PECK, M.A., M.D.

Pang Chang, North China, November 7, 1898.

Miscellaneous Notes and Receipts.

The first international exposition in Japan is planned for the year 1902. The Japanese government is already getting ready to take the first preliminary steps, and a suitable site for the exhibition is being chosen. A notification of the exhibition project is likely to be sent to the European and other governments as early as next spring.—Internationaler Technischer Courier.

An Old Receipt for Violin Varnish.—In 1696 there appeared at Nuremberg a book entitled "Kunst und Werkschule," published by one Johann Ziegers. This book, which is very rare, gives in the first chapter two hundred and four receipts for the production of different lacquers and varnishes. The following is a translation of one of them, bearing the pompous caption, "Exceedingly handsome violin and lute varnish of a famous violin maker at H."

This, to be made right, should be prepared in three glass vessels at the same time. In the first glass place good gum lac, 8 ounces; sandarac, 3 or 4 ounces; powder all very finely and pour on 4 "fingers" of the best and strongest spirit of wine, allow to dissolve, strain it through a linen cloth, and leave it stand in a quiet place until the clear varnish is on top, when it is poured into another glass. In a second glass resolve or extract cleanly dragon's blood, 1 ounce; "rother Beern-Wurzel" (red bear's wort?), 3 ounces. In the third glass dissolve colophony, 8 ounces; aloes succolini, 2 ounces; orlean (annatto, a yellow vegetable pigment), 3 ounces; and when everything has been sufficiently extracted and colored, pour together the contents of the vessels, put up the glass in a good manner, allow to stand undisturbed for eight days, pour off what is clear, and strain through a clean cloth. If the varnish is too thin, let some of the spirit of wine evaporate, until it is of the proper consistency, and keep in a good place. This will give a handsome red varnish, which can also be employed for gilding zinc.

Solubility of Certain Sulphides in Glass.—It is known that sulphides of the heavy metals, and especially cadmium sulphide, are dissolved unaltered by melted glass, which enables one to obtain a number of coloring substances for glass. In the production of glass colored with cadmium sulphide, certain difficulties had formerly to be surmounted; to-day, fancy glass, colored with cadmium sulphide, under the denomination of "Kaisergelb," is manufactured on a large scale, which is distinguished from the brownish-yellow silver glass by its brilliant deep yellow color, with a faint tinge of green.

As regards the solubility of other sulphides, we would mention the following mixtures:

A. Sand, 65 decigrammes; potash, 15 decigrammes; soda, 5 decigrammes; lime, 9 decigrammes; molybdenum glance, 3 decigrammes; sodium sulphide, 2 decigrammes. From this results a handsome, dark red-brown, ruby color. In thin layers the glass appears light brown-yellow; flashed on opal, it turns a dirty black-brown, which appearance is, by the way, also observed with other sulphides, and may be traced back to the fact that the sulphide precipitates from the rather concentrated solution on repeated heating.

B. Sand, 50 decigrammes; potash, 15 decigrammes; soda, 5 decigrammes; lime, 9 decigrammes; molybdenum glance, 1 decigramme; sodium sulphide, 2 decigrammes. This gives a yellow which strongly tarnishes glass.

C. Sand, 10 parts; potash, 3·3 parts; soda, 0·27 part; lime, 1·64 parts; molybdenum glance, 0·03 part. This gives a reddish-yellow glass with a very handsome tinge of red.

D. Sand, 100 parts; potash, 26 parts; soda, 1·8 parts; lime, 12 parts; cupric sulphide, 1·7 parts; sodium sulphide, 1·3 parts. This yields a sepia to sienna colored glass, dark brown, no longer transparent in a tolerably thick layer, but clear and undimmed. By heating, it turns dirty dark brown and dim; thinned with cutting-glass and flashed on opal, agreeably warm sepia shades are produced which, obtainable in any desired intensity, resemble the natural paper of the painters, and are especially suited as a background for designs or glass painting.

Experience has shown, however, that glass colored with sulphides is not so easy of production as that colored with silicates.

This is for the most part owing to the nature of the sulphides, to their ready oxidability, their comparatively greater volatility, and to the fact that metallic sulphides are entirely different from the substance of glass and cannot, therefore, be melted together with it in any desired quantity.—Diamant.

Science Notes.

A Galvani celebration took place at Bologna, Sunday, December 4, 1898. This was the centenary celebration of his death, which occurred December 4, 1798. Luigi Galvani was a great anatomist of the Bolognese school and is best known by his discovery of animal electricity. The celebration was very interesting and a committee of Italian telegraphers is now organizing a similar commemoration for Alessandro Volta.

It would appear that the Electrolytical Marine Salts Company dies a hard death. A committee was appointed last August to investigate its affairs and a report was made against the receivership, recommending that a committee of citizens would take the company's business in hand with ample authority to test the Jernegan process for getting gold from sea water and to disentangle, if possible, the legal snarl into which the affairs have drifted. It is extraordinary that people, in the closing years of the nineteenth century, should be so deluded by such an ignis fatuus.

An interesting discovery has just been made in the Library of the Vatican. The assistant librarian has just found the original manuscript treatise of Galileo Galilei on the tides. The manuscript is entirely in Galileo's handwriting and ends with the words "written in the Medici Gardens, June 8, 1616." His Holiness Pope Leo XIII. has taken great interest in the discovery, and the manuscript is to be published in sumptuous form at the expense of the Vatican. It has always been considered that the original of this work was lost; so it is all the more valuable, as it differs considerably from the text hitherto accepted as Galileo's, which is now in process of publication, together with Galileo's complete works, by a learned Italian society, the Accademia della Crusca.

Sir Edward Cecil Guinness, now Baron Iveagh and head of the great brewing firm in Dublin, has presented $1,250,000 to the Jenner Institute of Preventive Medicine, in Great Britain. The purpose of this munificent gift is to promote researches in bacteriology and other forms of biology as bearing on the causes, nature, treatment, and the prevention of disease. Heretofore, there have not been adequate facilities in the United Kingdom in carrying on investigations of this nature, as there should be, but now by this princely gift the opportunities for research will compare favorably with any similar establishment in the world. The gift comes at an opportune time, as many of the misguided inhabitants of England refuse to have anything to do with vaccination, and the time is almost ripe for an epidemic which will bring them to their senses.

A colored person called William King, of New Bedford, Mass., has enjoyed the uninterrupted possession of two hearts for a century, as he is one hundred years old, and is still so hale and literally hearty as to be able to bend bars of iron across his arm. According to The New York Herald, which records this remarkable freak of nature, Dr. Munroe B. Long, of the Muhlenberg Hospital staff, a physician of high repute, after visiting King, said: "King has one heart on the right and one on the left side of the chest, whose separate beats in unison could plainly be determined. By a certain muscular contraction King let one heart drop to the left iliac region, where I clearly heard the beating; then let the other heart drop to the right iliac region, where its beating was also plainly heard, both beating in the lower part of the abdomen in unison. Next, King threw over the interior of the abdomen a wall of bone from the neck down, giving every evidence of having two sternums, or breastbones, one of which is movable at his will and seems to lie behind the regular breastbone when in repose."

Experiments in the use of kites for meteorological purposes recently tried by A. L. Rotch, of the Blue Hill Observatory, Boston, Dr. Hergesell, of the Meteorologisches Landesinstitut, Alsace-Lorraine, and others, have given such very satisfactory results as to arouse the greatest interest in all scientific circles. The experiments with this kite, which was 26 feet long and 13 feet wide, weighed 16·5 pounds, and had a surface covering an area of 129 square feet, were made last August at Krzeszowice, near Krakow, and were remarkably successful. The kite rose with a rush, and the entire length of the string, 1,115 feet, was let out by using a windlass with a band brake. With a wind of about 20 feet the kite carried a load of about 66 pounds, which is more than even the heavy instruments weigh. The motion of the kite was quiet and uniform, only a slight tacking indicating a change of wind. At a height varying from 190 feet to 330 feet the only effect of a change in the pressure of the wind was to cause a moderate ascension when the force of the wind increased, and a slow descent when the wind pressure decreased. The use of a tail or landing-line, such as is generally attached to a balloon, proved most satisfactory. The line was 33 feet long, and hung from the neck of the rudder. The experiment of securing a dynamite cartridge to the landing-line and exploding it at a considerable height was tried, and the result showed that the kite could, if desired, be used for the purpose of producing rain by explosions.—Illustrirte Zeitung.

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NAVIES OF THE WORLD.

III.—FRANCE.

In many respects the French navy is unique among the great navies of the world. There is no other in which the ships, as a whole, differ so markedly from those of other nations, or in which such a wide diversity of design is shown among the battleships and cruisers themselves. In any great naval review, such as has recently taken place at New York, Kiel, or Spithead, it is a matter of small difficulty, even for the layman, to pick out the vessels of the French republic. The long protruding ram, the sharp "tumble-home" of the sides, the towering upper works, and the enormous military masts, bristling with guns, are characteristic features more or less conspicuous in all the ships that fly the tricolor.

The French naval architects have always worked with a free hand. From the days of Napoleon III., when "La Gloire" led the way in ironclad construction, they have been bold and original in their work, and many of the best features of modern construction are due to their initiative. Like all experimentalists, they have made many mistakes, as the French critics themselves have always been ready to admit; but there are certain excellent features of design to which, amid all the many fluctuations of style and type, they have tenaciously clung—features which the other nations are only now beginning to realize as absolutely essential in a first-class warship, whether she be battleship or cruiser. First among these we may mention a continuous belt of armor from stem to stern at the waterline and a high command for the guns. Modern developments in shell-fire have rendered necessary the first feature, and the second is becoming increasingly necessary for those sea-going qualities which are put down as of prime importance in modern ships. Now, with all their passion for novel and even fantastic design, the French have had the good sense not to leave a single foot of the waterline unprotected by armor, and, with scarcely an exception, they have carried the topsides of their ships high above the waterline and given the guns an unsurpassed command.

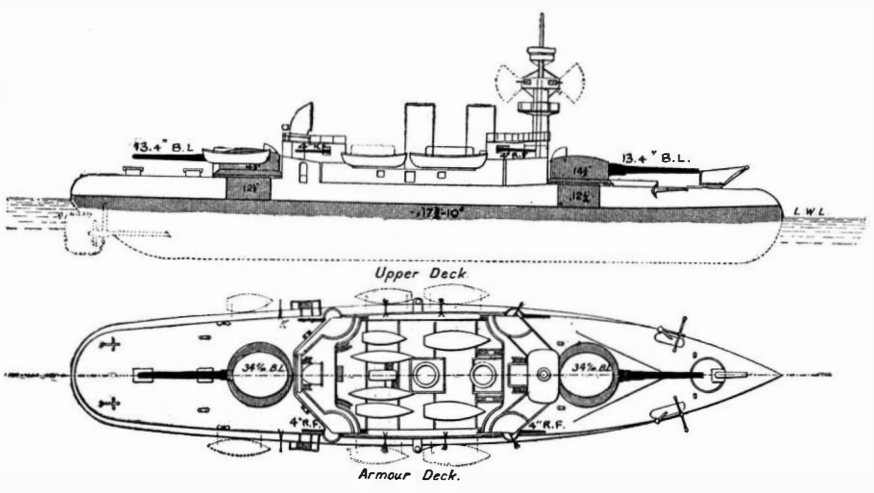
It is true these qualities may have been pushed too far. While the waterline has been protected, a vast area of the ship's sides, extending from the top of the armor belt to the bottom of the barbettes, has been left unarmored and would be exposed to destruction even by the smallest rapid-firers of the enemy. It is also true that many of the French ships have proved to be top-heavy, the margin of stability being in some ships so slight that they dare not put the helm hard over at full speed for fear of capsizing. These are grave defects, the former of which is irremediable, while the latter has been remedied by removing military masts and cutting down the mass of upper works.

On the score of appearance we must confess to a partiality for the French vessels. While they may not have the clean, ship-shape look of the British vessels and our own, they do certainly convey an impression of formidable fighting qualities to a degree that is not found in the ships of any other navy. If an exception is to be made, it should be in favor of the battleships "Oregon," "Indiana," and "Massachusetts."

FIGHTING STRENGTH OF THE NAVY.—In our article, "The Comparative Strength of the World's Navies" (SCIENTIFIC AMERICAN, December 31, 1898), we showed that the effective fighting ships of the French navy numbered 144, made up as follows: Battleships 10 years old or less, 14; battleships from 10 to 20 years old, 9; battleships of between 20 and 25 years, some of which have been refitted, 12; coast defense vessels, 14; armored cruisers, 20; protected cruisers, 37; small cruisers and gunboats, 38. In this estimate no coast defense vessels were included whose speed is below about 10 knots. Fifteen knots for the cruisers and 12 knots for the gunboats and small cruisers was adopted as a limit.

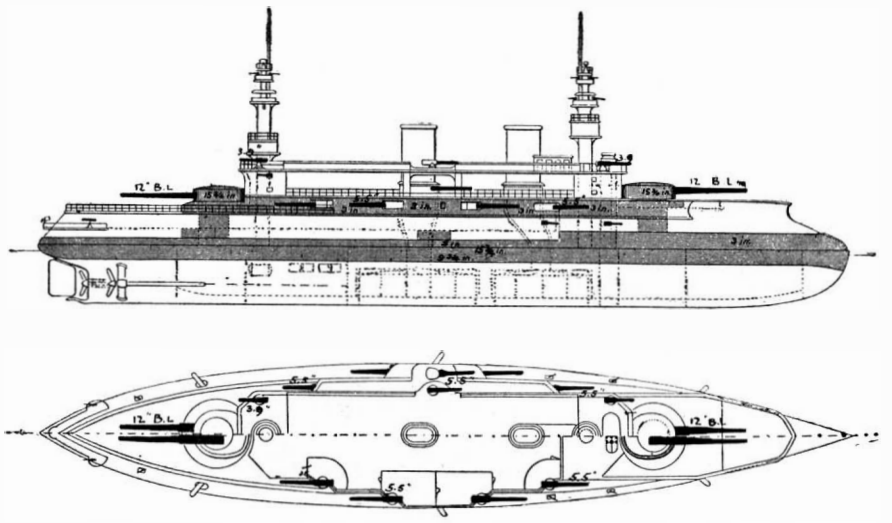
BATTLESHIPS.—Because of the diversity mentioned above, the ships of the French do not lend themselves so readily to classification as do those of the British navy. It is not possible to give a photograph and diagrams of one ship and say that she stands, in respect of guns, armor, and speed, for any other vessel of her class. The French have not built so strictly in classes, and where they have, successive administrations of the navy department have introduced numberless and very radical changes in the ships during their construction. Owing to this fact, the French fleets lose something of their tactical value, for it is of very great advantage to a fleet if, in its evolutions, all the ships have the same speed, turn through the same angle for the same degree of helm, and have a common point or points on which they can concentrate their maximum weight of fire.

The most homogeneous and powerful squadron at present in commission is that composed of the four fine battleships of the "Charles Martel" type, a striking illustration of which is given on the front page. With these should be mentioned also the "Jaureguiberry." All of these ships have a speed of about 18 knots; all but the "Massena" have a complete waterline belt varying from about 10 to 17 inches in thickness; and they all carry their heavy guns after the French characteristic style in four separate heavily armored turrets, one forward, one aft, and one on either beam. They also have the excellent feature of carrying the eight heavy rapid-fire guns of the secondary battery in turrets of 4-inch armor, the "Jaureguiberry" having these guns in pairs on the spar deck in four turrets, two forward, two aft, and the four ships of the "Carnot" class carrying these guns singly

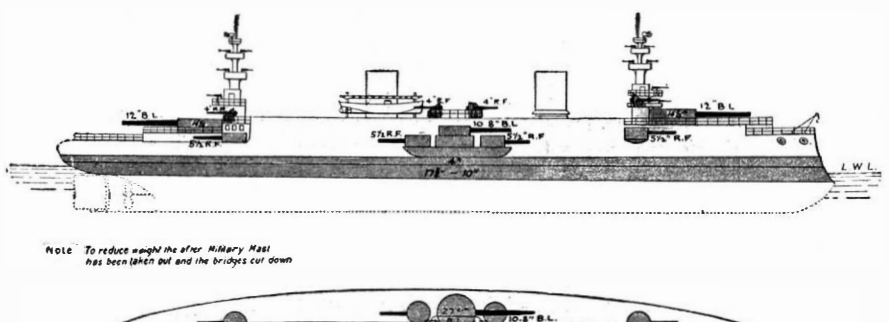


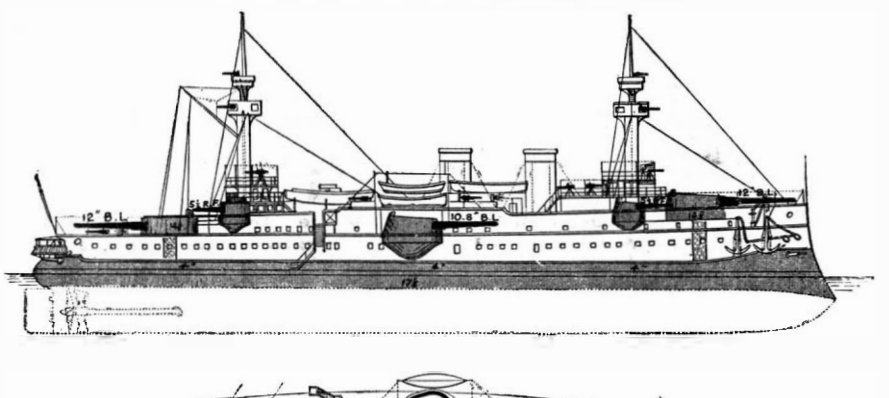
"Valmy" Class. Four Ships.

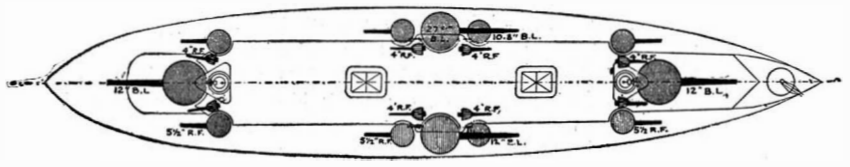
"Valmy" and "Tréhouart" have 13·4-inch guns in the turrets and four 3·9-inch guns. The "Bouvine" and "Jemmappes" have 12-inch guns in the turrets and eight 3·9-inch guns.



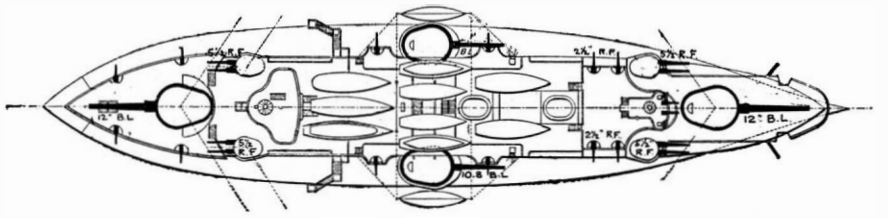
First-class Battleship "Charlemagne," 11,275 tons, 18 knots. Class of Three Ships. Also "Iéna" and "A 9," 12,052 tons, 18 knots.



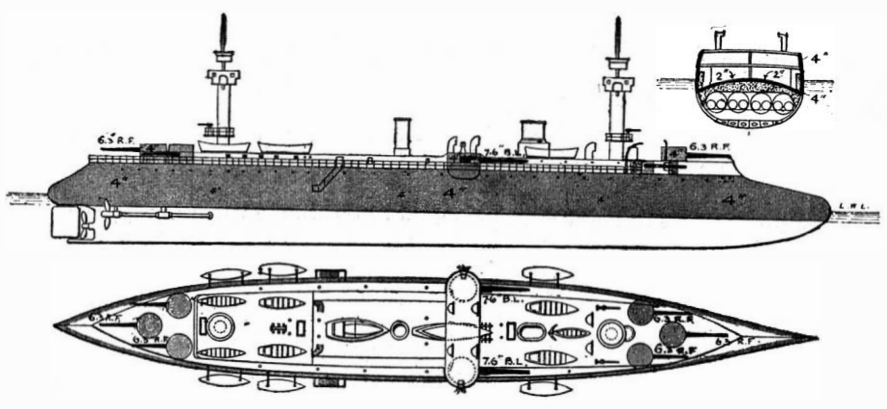




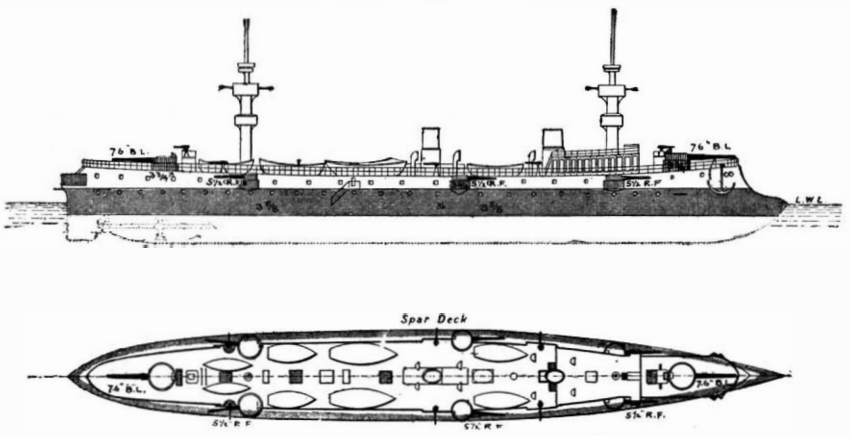
"Carnot" Class of Four Ships.



The "Jauréguiberry."



The "Dupuy de Lome."



The "Bruix" Class of Four Ships.

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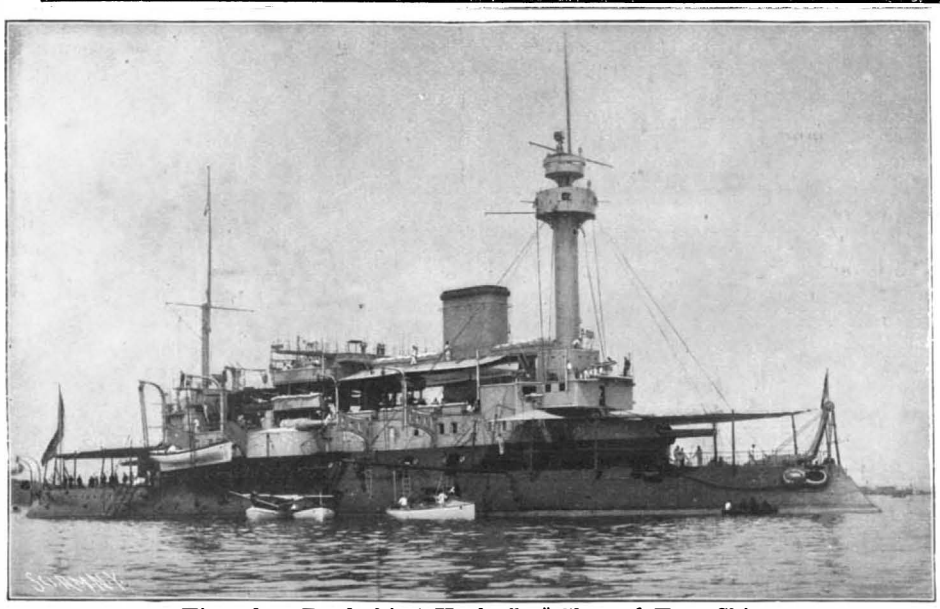
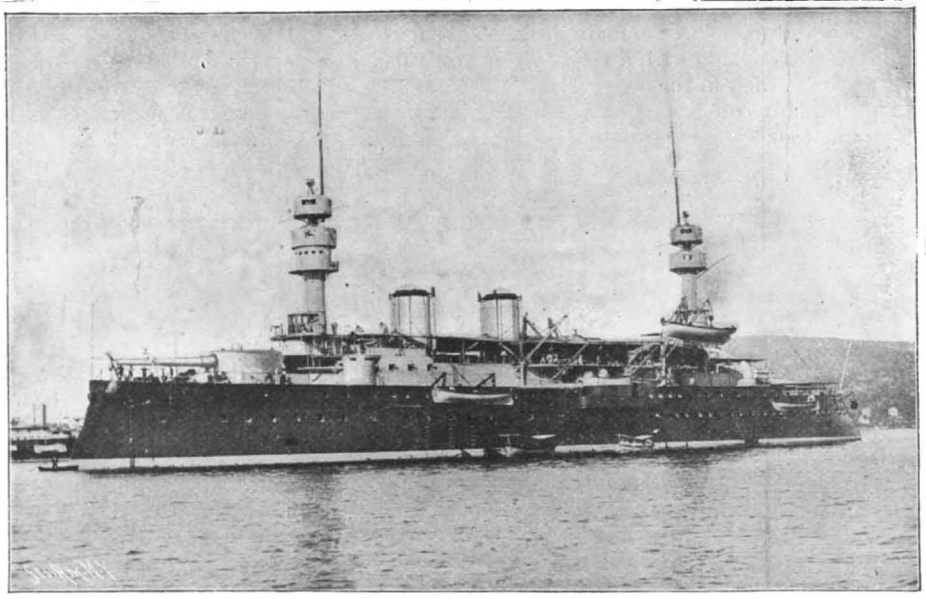


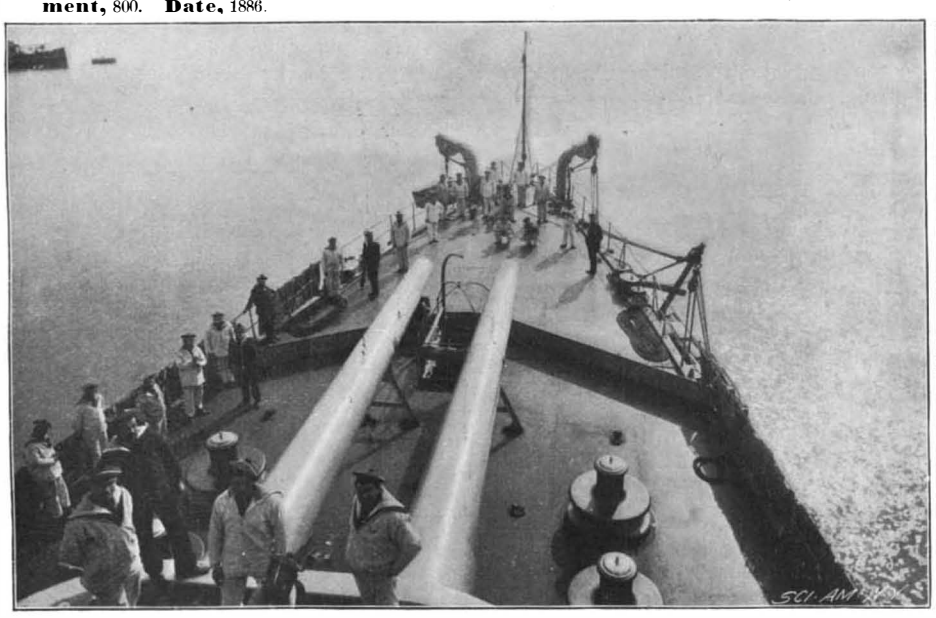
First-class Battleship "Hoche." * Class of Four Ships.

Displacement, 10,997 tons. **Speed,** 16 knots. **Normal Coal Supply,** 800 tons. **Armor:** Continuous belt, 18 inches; deck, 3 inches; gun positions, 16 inches.. **Armament,** two 13·4-inch, two 10·8-inch, eight 5·5-inch rapid-fire, eight small rapid-firers, twelve machine guns. **Torpedo Tubes,** 5. **Complement,** 800. **Date,** 1886.



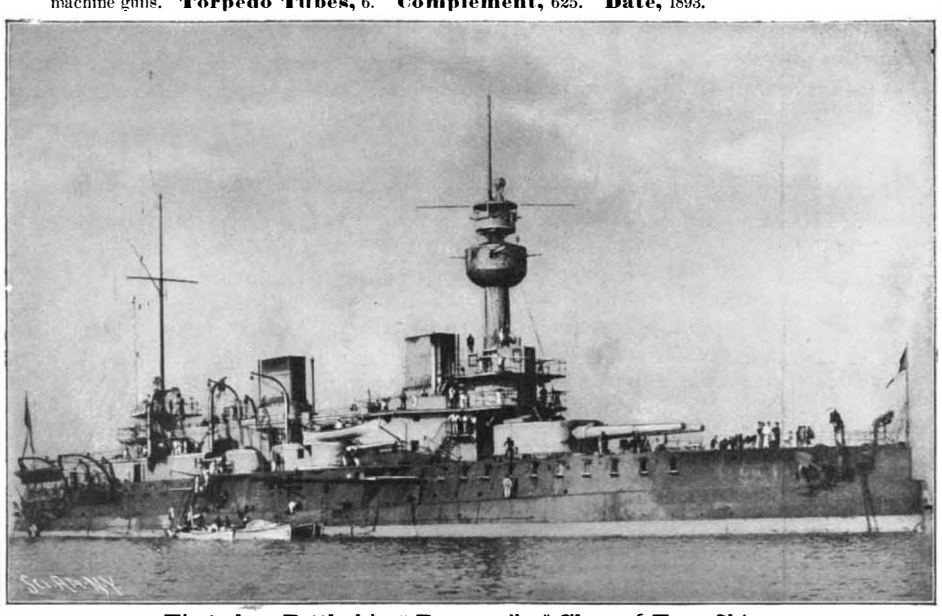
First-class Battleship "Jaureguiberry."

Displacement, 11,824 tons. **Speed,** 18 knots. **Normal Coal Supply,** 700 tons. **Armor:** Continuous belt, 17 to 4 inches; deck, 2¾ inches; gun positions, 14½ inches. **Armament,** two 12-inch, two 10·8-inch, eight 5·5-inch rapid-fire, four 2·5-inch rapid-fire, twelve 1·8-inch, eight 1·4-inch rapid fire, and eight machine guns. **Torpedo Tubes,** 6. **Complement,** 625. **Date,** 1893.



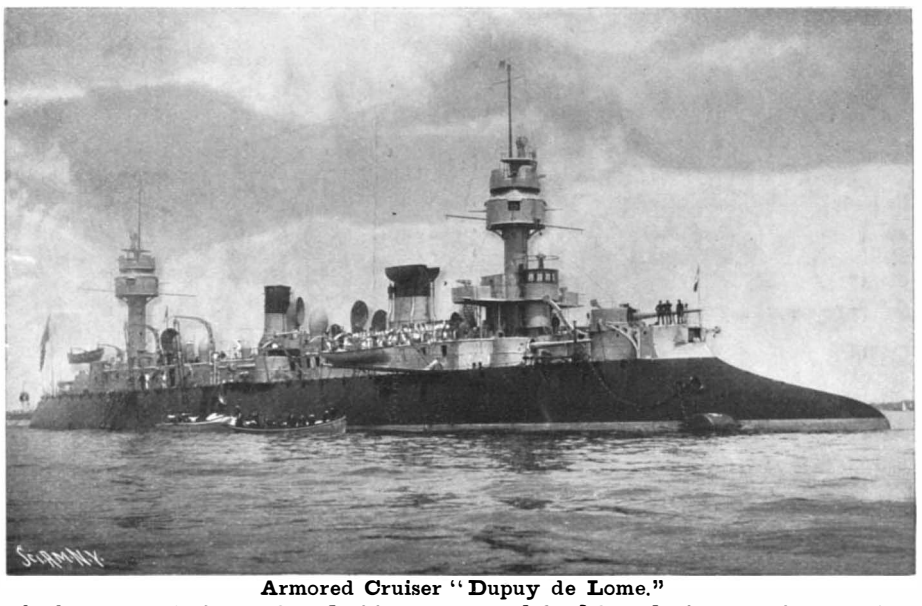
Forward Pair of 13·4-inch Guns on the "Brennus."

Weight of Gun, 53 tons. **Weight of Shell,** 926 pounds. **Muzzle Velocity,** 2,655 feet. **Muzzle Energy,** 44,230 tons. **Perforation of Iron at Muzzle,** 42·5 inches.



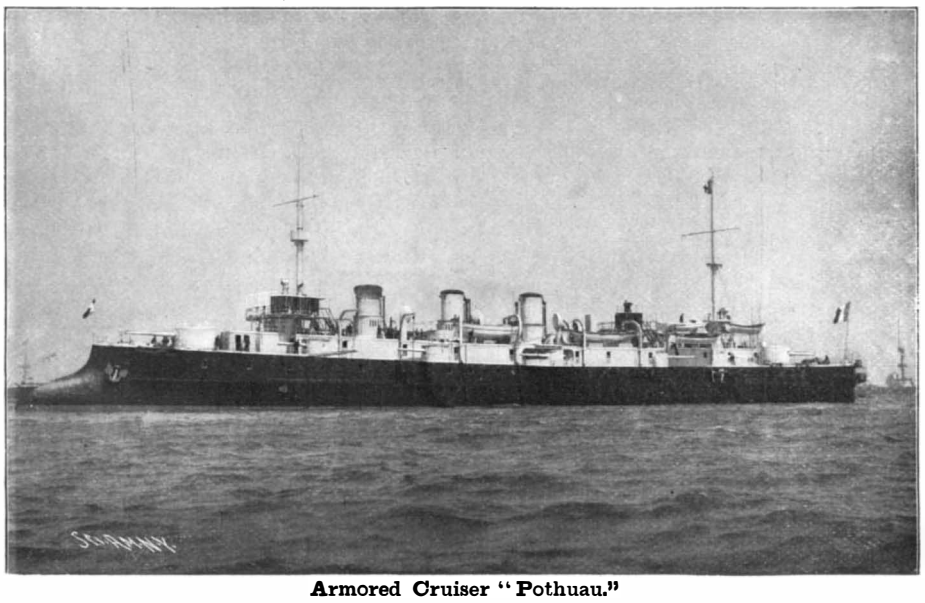
First-class Battleship "Brennus." * Class of Four Ships.

Displacement, 11,395 tons. **Speed,** 17·1 knots. **Normal Coal Supply,** 800 tons. **Armor:** Continuous belt, 15¾ inches; deck, 4¾ inches; gun positions, 15¾ inches. **Armament,** three 13·4-inch, ten 6·4-inch rapid-fire, four 2·5-inch, eight 1·8-inch rapid-fire, eight machine guns. **Torpedo Tubes,** 4. **Complement,** 696. **Date,** 1891.



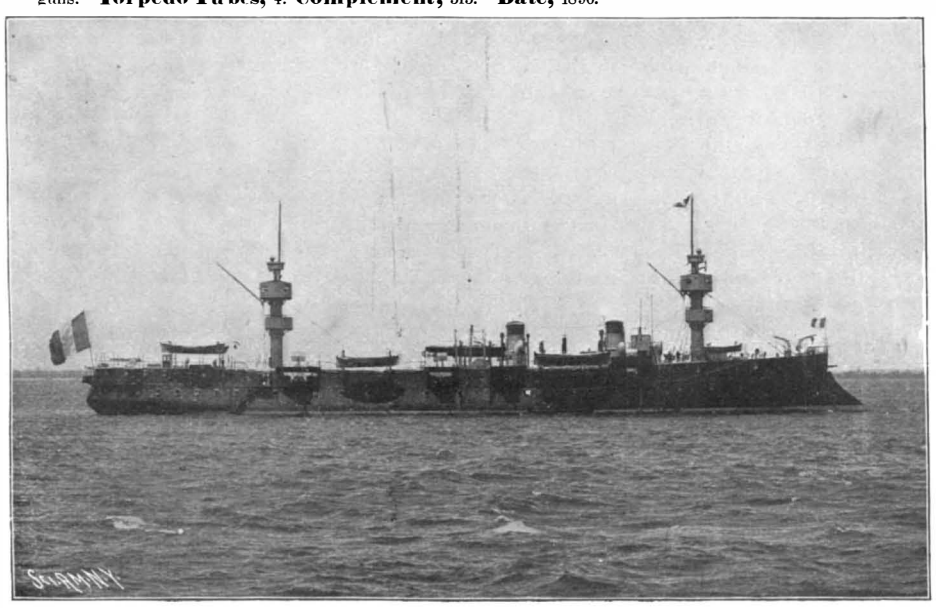
Armored Cruiser "Dupuy de Lome."

Displacement, 6,406 tons. **Speed,** 20 knots. **Normal Coal Supply,** 900 tons. **Armor:** Completely sheathed to upper deck with 4-inch armor; deck, 2 inches; gun positions, 4 inches. **Armament,** two 7·6-inch B. L. guns, six 6·4-inch rapid-fire, twelve 2·5-inch rapid-fire, six 1·8-inch rapid-fire, eight machine guns. **Torpedo Tubes,** 4. **Complement,** 515. **Date,** 1890.



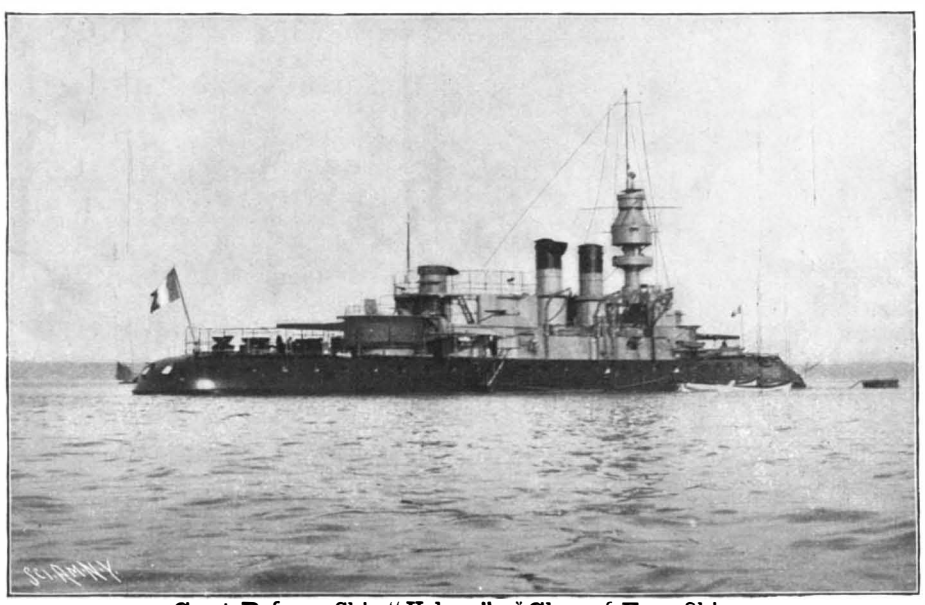
Armored Cruiser "Pothuau."

Displacement, 5,360 tons. **Speed,** 19·2 knots. **Normal Coal Supply,** 538 tons. **Armor:** Complete belt 3⅛ inches to 2 inches; deck, 3⅜ inches; gun positions, 9½ inches. **Armament,** two 7·6-inch B. L., ten 5·5-inch rapid-fire, sixteen 1·8-inch, eight 1·4-inch rapid fire. **Torpedo Tubes,** 5. **Complement,** 461. **Date,** 1895.



Protected Cruiser "Jean Bart." * Class of Six Ships.

Displacement, 4,109 tons. **Speed,** 19 knots. **Normal Coal Supply,** 940 tons. **Armor:** Deck 4 inches. **Armament,** four 6·4-inch rapid-fire, six 5·5-inch rapid-fire, fourteen 2·5-inch and 1·8-inch rapid fire, eight machine guns. **Torpedo Tubes,** 5. **Complement,** 332. **Date,** 1889.



Coast Defense Ship "Valmy." * Class of Four Ships.

Displacement, 6,592 tons. **Speed,** 16·7 knots. **Normal Coal Supply,** 300 tons. **Armor:** Belt, 17¾ inches; gun positions, 17¾ inches; deck, 4 inches. **Armament,** two 13·4-inch, four 3·9-inch rapid-fire, four 1·8-inch rapid-fire, 10 machine guns. **Torpedo Tubes,** 2. **Complement,** 297. **Date,** 1892.

* There are considerable variations in the vessels of this class.

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From photographs by Symonds & Co., Portsmouth, England.

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in eight turrets on the main deck. This disposition of the guns is made with a view to securing a heavy end-on fire, which in the case of the "Carnot" class (see deck plan) consists of one 12-inch gun, two 10·8-inch guns, four 5·5-inch, and four 3·9-inch rapid-firers.

It will be seen that this quadrilateral arrangement of the heavy guns in four turrets, as compared with their arrangement in two turrets, as in our "Oregon," gives a heavier concentration ahead or astern (three guns as against two), but a weaker fire on the beam (three guns as against four). It is doubtless the fact that most fighting will be carried on with the enemy abeam or on the quarter, that has led the French to abandon the quadrilateral arrangement in their latest ships of the "Charlemagne" and "Iéna" type.

The guns are of a modern and very powerful type. The 12-inch weapon, which weighs 46 tons, fires a 644-pound projectile with a muzzle energy and velocity of 30,750 foot-tons and 2,625 foot-seconds, the muzzle penetration being 37·3 inches of iron. The 10·8-inch gun, which weighs 35 tons, fires a 476-pound projectile with a muzzle velocity of 2,625 foot-seconds and a muzzle energy of 22,750 foot-tons, the penetration of iron being 33·7 inches, or equal to that of our 13-inch gun, which weighs, by the way, nearly twice as much as the smaller weapon. Though the 5·5-inch guns of the rapid-fire battery are rather light, according to modern ideas, which favor nothing less than 6-inch guns for this purpose, they are very formidable weapons. They fire a 66-pound projectile with a velocity of 2,625 foot-seconds and an energy of 3,100 foot-tons, the penetration being 17·7 inches of iron. This is a little more than our present 6-inch gun. At long ranges, however, owing to the rapid falling off of the velocity due to the lighter weight of the shell (66 pounds as against 100 pounds), the French gun is not so effective. In addition to the rapid-firers in turrets, the "Carnot" carries eight 4-inch rapid-fire guns on the superstructure and bridges, very efficient weapons, capable of penetrating 14·3 inches of iron at the muzzle. These guns are mounted behind 2·8-inch shields at a height of 35 and 40 feet above the sea.

The remarkable form of the hull of these ships above the water is due to what is known as the "tumble-home" of the sides, which curve sharply inward from the waterline and then with a reverse curve run vertically up to the spar deck. This is an exaggeration of a system adopted universally in the old wooden men-of-war. It has the advantage of reducing the width and weight of the upper decks, thereby adding to the ship's stability, and it allows the turrets to stand clear of the hull and gives the guns a more extended arc of fire fore and aft. In their latest ships the French show a disposition to adopt the vertical-sided form common in other navies.

Taken altogether, these ships with their water-tube boilers, high speed, ample protection, powerful and modern armament, and double armor decks, would probably prove to be the equal of any vessels afloat in fighting power. The name of the five are "Charles Martel," "Carnot," "Bouvet," "Massena," and "Jauréguiberry." An unusually handsome cut, showing the last-named ship on her trial trip, which was crowded out of the present article, will be shown in the SUPPLEMENT of next week.

In the later ships of the "Brennus" and "Charlemagne" types the French have adopted the two-turret plan for the big guns, and have placed the secondary battery in an armored citadel amidships, thereby for the first time in their history following the lead of the English. The "Brennus" (11,824 tons and 17·1 knots speed) carries two 13·4-inch guns in a turret forward and one 13·4-inch gun in a turret aft. She has a continuous belt of 15¾ inches maximum thickness, and above this is a 4½-inch belt also reaching from stem to stern. The powerful secondary battery of ten 6·4-inch rapid-fire guns is carried on two decks in a central citadel of 4-inch armor, which extends from the top of the belt to the main deck. The 13·4-inch guns are the most powerful weapons carried in any navy at the present time. Their muzzle energy is 44,230 foot-tons and they can penetrate 42 5 inches of iron at the muzzle. The 6·4-inch gun is also of exceptional power. It fires a 99·2-pound shell with a velocity of 2,625 feet per second. The resulting energy is 4,730 foot-tons and penetration of iron, 20 inches at the muzzle.

In the "Charlemagne," "St. Louis," and "Gaulois," sister ships of 11,275 tons and 18 knots, now about completed, the French have returned to the 12-inch gun, the main armament consisting of four of these weapons, carried two forward and two aft in turrets. The secondary battery of ten 5·5-inch guns is carried in broadside behind a citadel of 3-inch steel, but the space between the gun deck and the armored deck is entirely unprotected and would be open to destruction by shell fire. In addition to the 5·5-inch these ships carry eight 3·9-inch rapid-fire guns. The most novel structural feature in these ships is the waterline protection. First there is a continuous belt 15¾ inches thick, 6 feet 7 inches in depth. Above this belt is another, 3 feet in depth and 3 inches thick. At the top of the main belt is an armored deck, 3½ inches in thickness, and at the bottom of the belt, below the waterline, is a 1½-inch armored deck. The vitals of this ship should be absolutely proof against projectiles.

Except for the unarmored space between belt and citadel, these vessels are extremely formidable both for attack and defense, and the French are so well satisfied with the type that they are building two others, the "Iéna" and battleship "A 9," of slightly larger dimensions and more powerful armament. Their displacement will be 12,052 tons, speed 18 knots, and they will carry 6·4-inch in place of 5·5-inch guns in the secondary battery. Like the "Charlemagne" type, they will have triple screws and water-tube boilers.

The "Hoche," 10,997 tons, 16 knots, 18-inch belt, armed with two 13·4-inch, two 10·8-inch, and eight 5·5-inch rapid-fire guns, launched in 1886, is the only modern French battleship of low freeboard (see illustration). Her main battery is not of the modern type found in the "Carnot" and "Charlemagne," the guns being much shorter and of less power, and while she makes a good coast defense ship, she is not to be compared with the splendid vessels of later construction. Much trouble has been experienced in rectifying her bad points, the chief of which was the enormous superstructure amidships. By reducing this and removing her after military mast altogether the vessel has been rendered fairly stable, although she is still, on account of her heavy rolling, an unsatisfactory ship.

Of the older ships built over ten years ago, the "Magenta," "Marceau," and "Neptune," of 10,850 tons and 16¼ knots, are the best. They have a lofty freeboard and carry their four 13·4-inch guns (older pattern) at the level of the main deck, in four separate turrets. They have a powerful battery of fourteen 5·5-inch rapid-firers on the gun deck, mounted in broadside but unprotected. Their good points are high command for the main battery and good waterline protection. Their defects are the vast area of unprotected side between barbettes and belt and their instability. Inferior ships to these are the "Amiral Baudin," of about 11,911 tons and 15 knots, the "Formidable," 12,165 tons and 16 knots, and the "Amiral Duperré," 11,209 tons and 14·2 knots. All these have continuous belts 21½ inches in thickness, whose resisting quality is about equal to 10 inches of Krupp steel, and 17¾ inches on the barbettes. The guns are mounted in barbettes high above the waterline and, as in all the French ships, there is no protection between barbette and belt other than an armored ammunition trunk. The armament consists of two 14·6-inch B.L. guns, eight 6·4-inch rapid-fire, and eight 5·5-inch guns, besides many smaller rapid-firers. The "Courbet" and "Devastation," launched in 1881 and 1879, are of 10,800 tons and 15 knots. Each carries four 10·8-inch, four 9·4-inch, and six 5·5-inch guns. The armor is 15 inches on the belt, 9½ inches on the gun positions, and the deck is 2½ inches in thickness.

In the list of old battleships of over twenty years, there are a dozen ships, four of which are of wood and the rest of iron. Their speed varies from 10·8 to 14·8 knots, and their average displacement is about 7,500 tons. Their guns are of an old model and therefore of limited power. In fighting qualities these ships are comparable to the old broadside battleships of the British navy, though the breech-loading French gun of this period is superior to the muzzle-loading British gun.

COAST DEFENSE VESSELS.—There are 14 coast defense vessels in the French navy, of which the "Valmy" and her class are the best representatives. If the United States must build ships of the strict coast defense class, it would be far better to expend the money on vessels of the "Valmy" class instead of putting afloat such archaic designs as our new monitors of the "Arkansas" type will be. The "Valmy" (see particulars beneath engraving) is a 6,592-ton vessel of over 16 knots speed and great power. This vessel and the "Tréhouart" carry two of the new powerful 13·4-inch guns, while the "Bouvines" and "Jemmappes" carry each two 12-inch guns. These weapons are sufficiently elevated to be fightable in a fairly heavy sea, and the speed of the ships coupled with their 17¾-inch armor would render them formidable antagonists for any battleship. Four other formidable coast defense ships are the "Caiman," "Indomptable," "Requin" and "Terrible," of about 7,500 tons and 15 knots, with 19½-inch armor and carrying 16·5 and 13·4-inch guns in the main battery. A new coast defense ship of 8,948 tons and 17 knots, the "Henri IV.," is now building. She will be armed with two new type 10·8-inch breech-loading guns and seven 5·5-inch rapid-firers. The other coast defense ships are of less size, from 1,800 to 5,000 tons, and, though they are older, they are heavily armed and well protected.

ARMORED CRUISERS.—In the armored cruisers we find another class of vessels of which the French people may well be proud. On the first of January, 1898, there were twenty of these very effective ships either built or building. The best known of these is the "Dupuy de Lome." She is remarkable as being the only warship in the world that is completely clothed with armor. From stem to stern and from below the waterline up to the main deck she is protected by 4 inches of steel. Equal protection is given to the guns, each of which is inclosed in a separate turret of 4-inch steel. These guns are so disposed as to secure a theoretical concentration of fire as follows: Two 7·6-inch breech-loaders and three 6·3-inch rapid-firers ahead or astern and one 7·6-inch breech-loader and four 6·3-inch rapid-firers on either beam. In the amount of armor carried this vessel shows the effect of the French experiments with shells loaded with high explosives. The 4-inch armor was supposed to insure the bursting of these shells outside of instead of within the vessel. In the four ships of the "Bruix" class the armor is not carried so high, but as the turrets rotate upon the main deck immediately above the side armor, the protection to the turning-gear and ammunition is fully as complete. The other ships of this class are the "Charner," "Chanzy," and "Latouche-Treville." The speed is about 18·5 knots. For further particulars, the reader is referred to the cut of the "Charner" on the front page.

The "Pothuau," a vessel of 5,360 tons and 19·2 knots, is an enlarged "Charner," her battery being increased over that of the "Charner" by the addition of four 5·5-inch guns.

There is no doubt that French influence and example are responsible for the present disposition to build armored instead of protected cruisers. At present they have ten of these fine ships under way, none of which is of less than 7,700 tons displacement and 21 knots speed. The particulars are given in the accompanying table:

	Displacement in Tons.	Speed.	Belt Armor.	Main Armament.
Jeanne d'Arc.....	11,270	23	6 in.	Two 7·6-in., eight 5·5 in. r. f., twelve 3·9-in.
Dupetit Thouars..	9,517	21	"	Two 7·6-in., eight 6·4-in. r. f., four 3·9-in.
Gueydon.....	"	"	"	Two 7·6-in., eight 6·4-in. r. f., four 3·9-in.
Montcalm..... ..	"	"	"	Two 7·6-in., eight 6·4-in. r. f., four 3·9-in.
C 4..... ..	"	"	"	Two 7·6-in., eight 6·4-in. r. f., four 3·9-in.
C 7.....	"	"	"	Two 7·6-in., eight 6·4-in. r. f., four 3·9-in.
C 8.	"	"	"	Two 7·6-in., eight 6·4-in. r. f., four 3·9-in.
Desaix....	7,700	21	5 in.	Ten 6·4-in. rapid-fire.
Duplex.....	"	"	"	" " "
Kleber.....	"	"	"	" " "

PROTECTED CRUISERS.—The French navy includes 37 protected cruisers of a speed of 15 knots and over. The largest of these at present is the "Tage," 7,585 tons, 19 knots; though a larger ship, the "D'Entrecasteaux," 8,114 tons and 19 knots, was launched in 1896 and is nearing completion. Two commerce destroyers of the "Columbia" type are under construction. They will be known as the "Chateaurenault" and the "Guichen." They are about 800 tons larger than the "Columbia," are somewhat faster, and are considerably stronger in armament, but they do not carry so much coal. The particulars are: Displacement, 8,277 tons; speed, 23 knots; horse power, 24,000; coal supply, normal, 1,460 tons; armament, two 6·4-inch, six 5·5-inch, ten 1·8-inch, all rapid-firing.

Of cruisers between 4,000 and 7,000 tons displacement the French navy possesses thirteen, of which the "Jean Bart" class (six ships) is the best representatives. This vessel was at New York during the Columbus celebration and will be familiar to our readers. Her particulars are given beneath the illustration of the vessel. There is nothing special in the design of these ships, and the speed is about a knot less than that of similar vessels in other navies. There is not much disposition on the part of the government to increase the numbers in this class, the requirements of the French service calling for battleships and armored cruisers and the larger type of protected cruisers rather than vessels of the "Bruix" class.

In the small cruiser and gunboat class France possesses 38 vessels of an average displacement of 988 tons and an average speed of 17·1 knots, the speed being higher than that of similar vessels in any navy but that of Italy. Among the small cruisers the "Lalande," 1,926 tons, 22 knots, is the best representative. Her speed is 22 knots and she carries six 5·5-inch guns as her main armament. Fourteen of these vessels are of over 1,000 tons displacement, with an average speed of about 18·5 knots; the others range from 400 to 900 tons in displacement and from 12 to 23 knots in speed.

Taken as a whole, the French navy, though less than half as large as the British navy in numbers and displacement, is, we think, fully equal to it in quality. It is true, many of the ships show grave defects; it is also true that they present many excellent qualities which are not to be found in the British ships. In the way of defects, the unarmored space between barbettes and belts in the French ships is fairly offset by the unarmored waterline at the ends of the British vessels, while we think the French plan of placing the rapid-fire guns in armored turrets is preferable to the British plan of placing them in broadside armored casemates. In action the fragments of bursting shells that have passed into the ship will penetrate the thin rear walls of the armored casemates on the lee side of the ship, where the walls of the turrets would be proof against such fragments. In point of coal capacity, stability,

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and seaworthiness the British ships are superior; but it must be remembered that the French battleships and armored cruisers would probably never operate at any distance from the Channel or the Mediterranean.

In point of personnel, if past history is a sure guide, the British fleet is superior, possessing at least equal skill and certainly more tenacity. The seamen are largely recruited from the hardy fishermen of the Brittany and Normandy coasts, and to-day, as in the time of Nelson, they would doubtless exhibit the splendid qualities which were too often handicapped in the days of the frigate and three-decker by lack of dash and skill on the part of the captains and admirals of the navy.

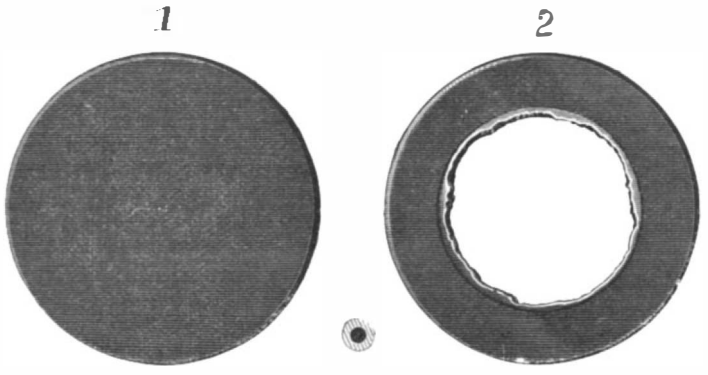
THE KEELY MOTOR FRAUD.

Ever since the death of John W. Keely, the fantastical collection of apparatus with which he puzzled the public, and incidentally diverted a golden stream into his private purse, has been as jealously guarded as ever it was in his lifetime. Recently the motor was removed, and the laboratory (Heaven save the mark!) in which for a quarter of a century he had conducted his so-called experiments was vacated. Whereupon Mr. Clarence B. Moore, whose mother had been the most generous of Keely's many victims, rented the premises, and calling to his assistance several gentlemen of high standing in the scientific world (some of whom, by the way, had been baffled witnesses of the Keely phenomena), proceeded to explore the premises in search of evidences of fraud.

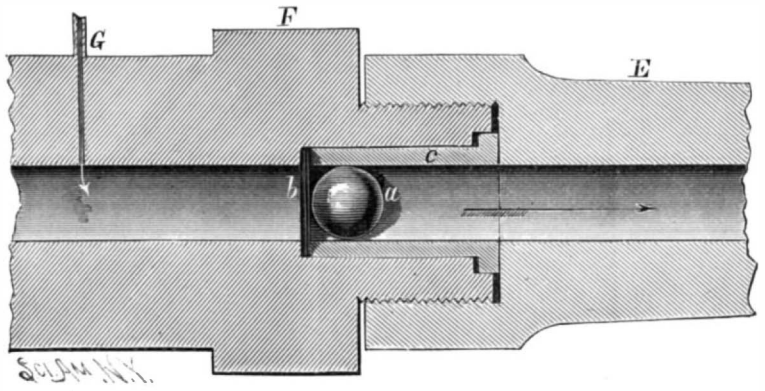
The result proves not merely that the motor was a fraud, but that it was a fraud, as we pointed out fifteen years ago in the columns of this journal, of the very simplest and most transparent kind: in fact, the presumption is strong that this most colossal humbug of the century depended for its success upon that ever-fruitful theme of the bogus company promoter—compressed air. In the first place, hidden beneath the floor of the building was found a large and massive metal sphere, whose weight is given as three tons, and whose bursting strength under pressure is stated to be so many tons to the square inch. Apparently at one time connected with this was found, hidden in the brick wall, a quantity of small brass tubing, of just the size and strength to match the strength of the steel reservoir, and corresponding to the tubing (see cut) used by Keely in his various public and private exhibitions. Underneath the upper floor of the house was found a false ceiling, well calculated to hide the necessary tubes for conveying the compressed air to the different air motors with which he produced his results; while a number of trap-doors were found scattered over the floor of this stage, from which, for a quarter of a century, this prince of humbugs played his part!

Many of our older readers will remember that from the very first this journal was emphatic in its opposition to the Keely mania, and endeavored, we think, with considerable success, to check, if it could not wholly prevent, such obvious swindling of the public. We pointed out that all of the results obtained by Keely could be duplicated by using compressed air in suitable apparatus, and in 1884, in the case of the Keely gun, conducted experiments which proved that in this case, at least, we were correct.

Keely had many different names for his newly discovered force, and just at the time of the famous gun experiments at Sandy Hook, he was pleased to call it "etheric vapor." Representatives of this journal were present on the occasion, and the accompanying illustrations were published in the SCIENTIFIC AMERICAN of October 11, 1884, in connection with an article exposing the trick by which the Keely Motor Company was able, in a single day, to send up its stock from nine cents on the dollar to fifteen cents, and swell its own bank account proportionately.



GAS CHECKS BEFORE AND AFTER DISCHARGE OF GUN.



LONGITUDINAL SECTION AT BREECH OF GUN.

The "vaporic" gun used on that occasion (it was nothing more or less than an air-gun) had a spherical knob secured to the breech, from which projected a "vibrator" (!) *H*. The breech was 4½ in. external diameter, the bore 1⅛ in., and the total length was 3½ feet. Just forward of the trunnion, at the point, *F*, the muzzle unscrewed, this construction being adopted to permit the placing of a gas check, *b*, in position. A sleeve, *c*, with a bore equal to that of the gun, was fitted in an annular recess in the forward part of the breech, *F*.

It will be seen that when the muzzle was screwed home, the sleeve was forced in until it held the gas check firmly in place. The latter consisted of three disks, having a common diameter of 1⅝ inches. The two front disks were of common hard rubber, $\frac{1}{32}$ inch in thickness, while the third disk, which was placed next to the pressure chamber, was of soft rubber packing, $\frac{1}{16}$ of an inch thick. The disks are shown in full size in Figs. 1 and 2, the former figure representing the disk before discharge, and the latter after discharge. It will be noticed that the broken disk shows clearly the imprint made by the end of the sleeve. The bore of the gun was 1⅛ inches, and a spherical lead bullet, *a*, was used. A copper tube, *D*, $\frac{3}{16}$ of an inch in external diameter and $\frac{1}{16}$ of an inch internal diameter, a full size cross section of which is shown between cuts 1 and 2, led the breech of the gun to the magazine, *A*, which was made of wrought iron and was 8½ inches external diameter by 4½ feet long. Another tube was connected by a wire, *C* (so said Keely; the wire was actually another tube) to a second magazine, *B*. The supply from the small to the large magazine and from the large magazine to the gun was controlled by stop valves, as shown in the cut. These magazines, according to Mr. Keely, had been charged with "interatomic ether," which had been evolved by a "generator" set up in Mr. Keely's Philadelphia workshop.

In loading the gun the gas check was first placed in position and the muzzle screwed up tightly; then the ball was introduced at the muzzle and rammed home. Next the stop-cock was opened to admit the "etheric vapor" to the breech, and, after waiting a few seconds, the "vibrator," *H*, was struck with a wooden mallet, and the charge exploded, driving the bullet at a target 500 yards from the gun. Nineteen rounds were fired, and then a conical steel bullet was driven through 4 inches of pine plank placed a few feet from the gun. The noise of discharge closely resembled that caused by a common shotgun when loose powder having no ramming upon it is exploded. A small cloud of white vapor, which immediately disappeared, followed the discharge. The velocities of three consecutive shots were 482, 492, 523 feet per second. "The gun was then unscrewed," says the account of the proceedings, "the valve at the magazine was opened, and visitors were permitted to examine the 'interatomic ether' as it issued from the pipe. It had but a small trace of odor, no taste, and had no effect upon the lungs." Precisely; for there is not a question in the world but what the "interatomic ether" as it issued from the pipe was the common air at atmospheric pressure.

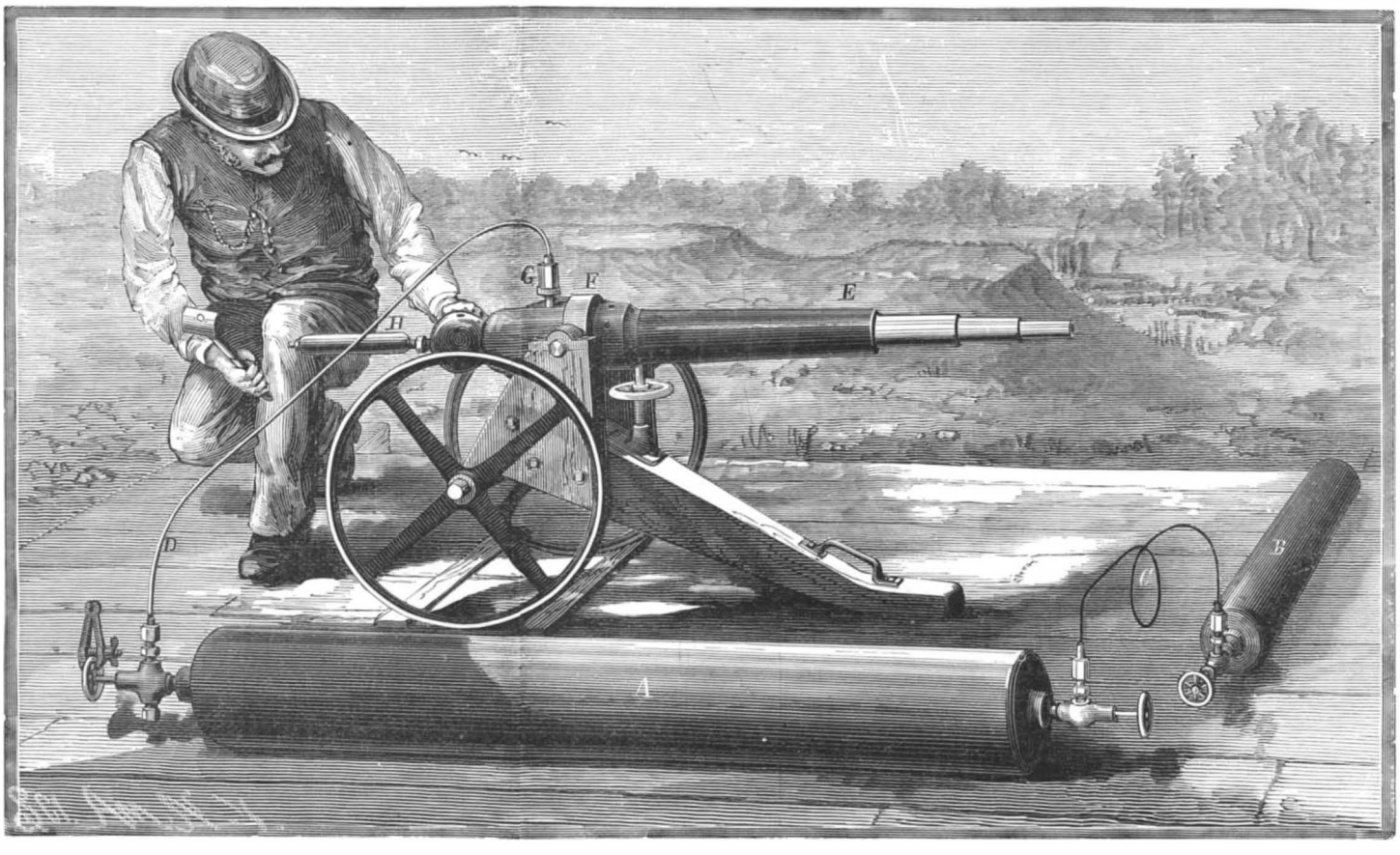
We declared at the time that the magazine, *A* and *B*, had been charged with compressed air at many thousand pounds pressure, and that when the stop-cock was opened, the air, owing to its high pressure, passed rapidly to the breech, behind the gas check, where it developed sufficient pressure to burst the check and expel the ball.

The tapping on the "resonator," *H*, had nothing whatever to do with the discharge, and was merely one of the charlatan "passes of the wand" by which this accomplished rogue bewildered his audience.

To prove the fact to his satisfaction, the representative of the SCIENTIFIC AMERICAN requested Keely to allow him to handle the wooden mallet (his purpose being to delay the tapping until after the discharge). It is needless to say that Keely refused.

Soon after Keely's gun experiments the editor of this journal conducted experiments in the same direction in New York, and an experimental gun was made of seamless drawn brass pipe of 1 inch bore and 2 feet in length, and set vertically under a skylight shaft several stories in height. A union joint was screwed to the bottom of the pipe, with a pipe connecting to a coil of about 100 feet of 1¼ inch pipe, placed beneath the gun.

A further connection was made with a hydraulic



TEST OF THE KEELY "VAPORIC" GUN AT SANDY HOOK, SEPTEMBER, 1884.

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testing pump and high pressure gage. In the union joint were placed two disks of hard rubber, each about $\frac{1}{8}$ of an inch in thickness, and above the disks a lead ball, 1 inch in diameter, was placed. On the railing of the next story above was laid a target of five tiers of 1¼ inch plank, directly over the range of the gun. The whole pipe being full of air at atmospheric pressure, the pump was put in operation, water being forced into the lower end of the pipe reservoir. This forced the air up through the pipe line and compressed it under the hard rubber disks. When a pressure of 1,500 pounds per square inch was reached, the disks ruptured and the gun was discharged.

The bullet passed through the 6¼ inches of pine planks, making a clean cut through the first planks and badly shattering and displacing the last plank of the target, then struck and splintered a beam under the roof and rebounded to the floor. This was repeated several times, the disks bursting at between 1,300 and 1,500 pounds and showing the great power of compressed air in the discharge of the projectiles. The prestidigitator part of Keely's exceedingly small feed pipe to the chamber behind the disks and bullet, and his bogus tapping of the resonator, it is needless to say were not included in our experiment.

In conclusion we would remind our readers that the death of this prince of rogues does not imply that the type is extinct; and that "resonators," "vibrators," "etheric vapors," and others of that ilk, still walk the earth dressed in the ever-varying garb with which such human sharks as Keely are still seeking to catch the unwary.

Radium: A New Body, Strongly Radio-Active, Contained in Pitchblende.

BY M. P. CURIE, MME. P. CURIE, AND M. G. BEMONT.

Two of us have shown that, by purely chemical processes, a strongly radio-active substance can be extracted from pitchblende. This substance is near bismuth in its analytical properties. We therefore came to the conclusion that pitchblende might contain a new element, for which we proposed the name of polonium.

Our subsequent researches are in accord with the results first obtained, but, concurrently with these, we have met with a second substance, strongly radio-active, and entirely differing from the first body in its chemical properties.

Polonium is precipitated from its solution by sulphureted hydrogen. Its salts are soluble in acids, and are precipitated by water; polonium is completely precipitated by ammonia. The new radio-active substance we have discovered has, to all appearance, the properties of almost pure barium. It is not precipitated either by sulphureted hydrogen nor by ammonium sulphide nor by ammonia; its sulphate is insoluble in water and acids; the carbonate is insoluble in water; the chloride is very soluble in water, but insoluble in concentrated hydrochloric acid and in alcohol. It gives the barium spectrum easy to recognize. Nevertheless, we believe this substance, although in greater part consisting of barium, contains besides a new element which gives to it radio-activity, and which is close to barium in its chemical properties.

Here are the reasons which lead us to this opinion:

1. Barium and its compounds are not radio-active; also one of us has shown that radio-activity appears to be an atomic property, persisting through all the chemical and physical states of the substance. From this point of view the radio-activity of our substance, not being due to barium, should be attributed to another element.

2. The first substances we obtained had, in the state of hydrated chloride, an activity 60 times as great as that of metallic uranium (the radio-activity was measured by the amount of conductivity conferred on air in our apparatus). On dissolving these chlorides in water and precipitating a portion by alcohol, the part precipitated is much more active than the part left in solution. Taking advantage of this fact, we may, by a series of fractionations, obtain chlorides more and more active. We have thus obtained chlorides having an activity 900 times greater than that of uranium. We were stopped here by failure of material, but, from the progress of the operations, we could see that the activity would have augmented still more had we been able to continue. These facts may be explained by the presence of a radio-active element, the chloride of which is less soluble in alcoholized water than is that of barium.

3. M. Demarçay has been good enough to examine the spectrum of our substance. The results are given in a note following this. M. Demarçay has found in its spectrum a ray which does not appear to be due to any known element. This ray, scarcely visible with the chloride 60 times more active than uranium, is notable with the chloride concentrated by fractionation to an activity 900 times that of uranium. The intensity of this ray augments, therefore, with the radio-activity, and this we think is a very serious reason for attributing it to the radio-active portion of our substance.

These different reasons lead us to believe that the new radio-active substance contains a new element, to which we propose to give the name of radium.

We have determined the atomic weight of our active barium by estimating the chlorine in the anhydrous chloride. We have found numbers differing very little from those obtained with inactive barium chloride; however, the numbers for the active barium are always a little higher, but the difference is of the order of magnitude of experimental errors. The new substance certainly contains a very large proportion of barium. In spite of this, its radio-activity is considerable. The radio-activity of radium ought therefore to be enormous.

Uranium, thorium, polonium, and radium, and their compounds, render air a conductor of electricity, and act photographically on sensitive plates. From these points of view polonium and radium are considerably more active than uranium and thorium. On photographic plates we obtain good impressions with radium and polonium in half a minute. It requires several hours to obtain the same result with uranium and thorium.

The rays emitted by compounds of polonium and radium render barium platinocyanide fluorescent. Their action in this respect is analogous to that of the Roentgen rays, but is considerably more feeble. To make the experiment place on the active substance a very thin sheet of aluminum, and on this a thin layer of barium platinocyanide; in the dark the barium platinocyanide appears feebly luminous over the active substance.

We thus realize a source of light, very faint, it is true, but functioning without a source of energy. There is here a contradiction, at least apparent, to the principle of Carnot.

Uranium and thorium under the same circumstances give no light, their action probably being too feeble. —Comptes Rendus.

A Cable Steamer for the Philippines.

The War Department has authorized the Quartermaster's Department to secure at once an iron ship of from 1,000 to 1,200 tons burden to lay cables to connect the islands of the Philippines. The War Department has already ordered 166 miles of cable, which weighs 525 tons. It will be coiled in skeleton tanks in the various holds in the vessel. It is considered very important by the government to connect the various islands of the Philippines by cable.

The Current Supplement.

The current SUPPLEMENT, No. 1204, is a very interesting number. It is begun by "The Beginnings of Plastic Art in Europe," in which some curious archæological specimens are presented and a recent book is reviewed. "The Mineral Resources of Cuba" is a timely article. "Methods of Preparing Rubber" is an important technical paper. The work on the new buildings of the Paris Exposition is described in detail. "Acetylene," by Prof. Vivian B. Lewes, is an important and authoritative treatment of the subject. The usual three columns of notes are published.

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RECENTLY PATENTED INVENTIONS.

Agricultural Implements.

SUGAR-CANE WAGON.—MARK R. SPELMAN, New Orleans, La. This vehicle has fifth-wheels connecting the vehicle-body with the front and rear axles. A reach pivotally connects the axles with each other at their middles. Frames, connected at their outer ends with the respective axles, extend inwardly toward one another; and the sides of the frames converge at their inner ends. Diagonal braces crossing each other are pivotally connected with the inner converging ends of the frames. A wagon thus constructed can readily turn in a narrow space.

PLANTER.—CHIEVER C. and LEMUEL S. CAVES, Fremont, Iowa. This planter is especially adapted for planting potatoes, and is so constructed that the potatoes are introduced whole into the planter and automatically cut into proper pieces and planted. The planter is adapted to plant two rows simultaneously. Although designed primarily to plant potatoes, the machine can also be used as a corn-planter.

Bicycle-Contrivances.

BICYCLE OR SIMILAR MACHINE.—JOHN A. KELLY, Brooklyn, New York city. The bicycle of this inventor is driven by hand-power and is so constructed that both hands can be used at the same moment for driving and steering. A shaft or bar is connected with the driving-levers and with the steering-wheel, and has endwise movement in a direction transverse to the frame of the bicycle to effect the steering. The bar or rod, in steering the bicycle, is operated by moving the propelling levers in a line transverse to their driving motion.

BELL.—ORVEY PRICE, Forty Fort, Penn. The purpose of this invention is to provide a bicycle-bell which is arranged to permit a rider to throw the bell into gear with one of the bicycle-wheels in order to sound the gong. With this end in view, the inventor has provided his bell with a revoluble wiper, and with a loose clapper adapted to pass into the path of the wiper and to be thrown outward into contact with the gong, in order to sound the bell.

CHAINLESS GEAR.—KARMELL BROOKS, New York city. The bicycle-gear of this inventor is essentially a roller bevel-gear, the novel features of the device residing in the peculiar construction of the shaft. The device is made so that it will constantly maintain a proper relation between the driving-gears. The shaft of the gear is of spring or flexible construction, and by reason of this construction is enabled to compensate for any deflection of the frame, and to relieve the rider of the jar experienced when riding over rough roads. A novel brake is provided, which is applied by back-pedaling.

Mechanical Devices.

ALARM CLOCK.—ARTHUR C. REICHEL, Union Hill, N. J. To provide an alarm clock with two bells, differing in sound or pitch, and arranged that both alarms may be so sounded by one spring that one bell will ring alone for a short time, and then the two will ring together for a short time, is the object of the invention. The two alarms are respectively driven by primary movement gear-wheels. A lever coacts with one of the alarms to hold the alarm normally inactive. A slotted wheel has a projected portion engaging and normally holding the lever. A collar, driven by one of the gear-wheels, has a finger coacting with the slotted wheel, whereby the wheel is periodically moved so as to release the lever.

EXCAVATOR.—WILLIAM S. RUSSELL, Toledo, Ohio. This invention seeks to equip an excavator with an efficient device for supporting the front end of the machine and for turning the whole main car and frame completely around in order that it may work in both directions. The turn-table used supports the end of the machine while moving over the rails, and supports the whole machine while being swung around. The turn-table is detachable from the car-body, and, though loose, is held in place by flanged metal rings forming a seat to receive the upper ball-bearing ring of the turn-table. In order to turn the machine around, the front end of the car is raised by jack-screws until the flanges on the metal ring are clear of the turn-table. The table is then shifted back under the balance-ring, and the machine is lowered in place, the whole weight resting upon the turn-table.

DISH WASHING MACHINE.—ROBERT R. PARRY and EDWIN EVANS, Poultney, Vt. The machine has a reservoir and cover therefor. Two carriers are mounted to rotate in the reservoir and cover, and are adapted to be raised and supported above the water in the reservoir. A series of open-work receptacles contain the articles to be washed, and are arranged to conform with the outline of the carriers. Brushes are secured to one of the carriers. Means are provided upon the other carrier for holding the dishes so that they shall engage the brushes.

MERRY-GO-ROUND.—PETER J. SPRACKLEN, Kenton, Ohio. This invention provides a game-attachment for merry-go-rounds, which attachment is so constructed that a number of figures or articles may be brought, at the will of the riders, into the path of the striking section of a wind-engine or other form of motor for the purpose of determining how many, if any, of the figures or articles can be dislodged by the action of the motor.

MACHINE FOR SHAPING PLASTIC MATERIAL.—GUSTAV STOFF, Berlin, Germany. The machine is designed automatically to roll, form, and cut round-shaped pieces from rods of plastic material, such as marchpane, chocolate, caramel, and clay. The rods are placed above a pair of horizontal rotating rollers, each having several annular furrows or channels divided by sharp edges. The rollers are constructed to engage and to roll the rod placed above them, to change the rod by squeezing and forming while rolling into round-shaped pieces, and to cut the rod into sections.

Railway-Appliances.

CAR-BRAKE.—ERNEST B. and ADOLPH L. GESCHE, Bingham Lake, Minn. The brake provided by this invention is controlled mainly from the draw-heads of the car and is applied upon the inward movement of the draw-heads, the movement being caused by the stopping of the locomotive and the bumping together of the several cars of the train.

GRAIN-DOOR FOR CARS.—BENJAMIN W. DAVIS, Rock Springs, Wyo. Vertical guideways are arranged adjacent to the door-opening, which guideways are continued at their upper ends by a curved portion and a horizontal portion having a drop at its inner end. Offsets or supports are arranged without the guideways and adjacent to the curved portion, the upper surface of the offsets forming a portion of branch guideways extending outwardly from the main guideways. The door is provided with pins mounted to move in the guideways and branch guideways. By reason of this construction, the door can be held open, completely out of the way, when the car is being unloaded.

METALLIC RAILWAY-TIE.—GEORGE A. and THOMAS F. PENROSE and WILLIAM R. WARE, Meredith, Ark. The purpose of this invention is the provision of a tie, designed to be held in place without the use of spikes, the adjacent ends being fastened together without the use of fish-plates. The tie is made in longitudinal sections, each formed with a pair of lugs, arranged so as to engage opposite sides of the rails. The lugs extend over the corresponding base, web, and under side of the rail. Each lug is provided with an extension. Bolts pass through the lugs, extensions, and webs of the rails.

Miscellaneous Inventions.

ELASTIC TREAD HORSESHOE.—ARTHUR W. CROZIER and GEORGE SMITH, New York city. The horseshoe is fitted hot to the hoof, so that the rubber pads will form part of the shoe, the pads being removable and being provided with side calks. The pads lie snugly in panels made in the bottom face of the shoe between the heel and toe calks, and are held in position by nails driven through the shoe. The nails pass through eyelets which serve to prevent the pads from becoming lacerated by the nails, should they work loose.

AUTOMATIC LOCK FOR DUMB-WAITERS.—GUSTAVE SEABERG, Brooklyn, New York city. This invention seeks to provide a hoisting and operating mechanism which will hold a waiter at any point, and which will operate as well with the waiter supported from one side of the pulley as from the other. By means of a novel arrangement of two disks provided with interlocking inclines, of sheave-wheels and collars, the rotation of the supporting shaft in either direction is prevented when power is applied by the pulley carrying the hoisting rope. The shaft can nevertheless be allowed to rotate in either direction when the hand-operated rope is pulled.

ACETYLENE GAS-APPARATUS.—EUGENE BOURNONVILLE, Jersey City, N. J. This apparatus comprises essentially a generating-chamber, a gasometer, and automatic means for controlling the generation of gas. The generating chamber has a tapering bottom to permit the ready withdrawal of the lime residue, and is provided with a carbid-receptacle, wheel-like in form, and divided into a number of radial, carbid-containing compartments. The gasometer, by its action in rising and falling, automatically controls the generation of gas by means of a system of levers and rods connecting the carbid-receptacle with the gasometer. In order to prevent the escape of gas from the generator, a layer of oil is used, which constitutes an effective seal and renders the generator air-tight.

FOLDING BED.—JACOB LEVY, Brooklyn, New York city. The purpose of this invention is to provide a cheap and strong crib which may be made of iron and which may be readily folded into a small space. Each side and end of the bed is made as a frame. The parts are hinged together at the corners, so that when the bottom is removed or swung up these frames may fold so as to lie parallel to each other, and thus occupy less space than when opened out.

SPECTACLE ATTACHMENT FOR EYEGLASSES.—JOHN J. MUNDORFF, New York city. It sometimes happens that, in violently moving the body, eyeglasses fall off. For this reason an attachment has been devised which can be temporarily secured to the glasses and which converts them into a pair of spectacles. The attachment consists of spring-arms extending along opposite edges of the lenses, and

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having jaws attached to their ends adapted to embrace the edges of the lenses. The spring arms are bent to one side, in opposite directions, so as to throw the jaws normally out of line with each other, the object being to enable the jaws to be firmly clamped upon the lenses.

CANOPY FOR BOATS.—JOHN C. HARLOW, Janesville, Wis. This canopy is so constructed that it can be secured at any desired distance above the gunwales or lowered in order to protect the cockpit when the boat is not in use. The canopy is made so that a half-section at either side may be raised to enable a person to enter or leave the boat.

WIRE-NETTING FOR USE IN MANUFACTURING PAPER.—KARL KUFFERATH, Mariaweiler, Germany. The rapid wearing away of the wire fabrics used in carrying the films of pulp has been a great disadvantage in paper-manufacture. It is the purpose of this invention to overcome the difficulty, by providing a fabric having warp and weft threads, the warp-threads of which fabric are passed, with respect to the top of the fabric, over one weft-thread and under two of the contiguous weft-threads.

BOX-FASTENER.—RUDOLPH C. KUHN, La Crosse, Wis. The fastener is adapted to be applied partially to the body of the box and partially to the cover. The parts of the fastener are so applied that the cover may be quickly placed in position and securely locked and unlocked. The cover has at one edge bracket-carrying projections upon its inner face, one member of each bracket being adapted for engagement with the under surface of a cover-projection. The other member of the bracket is provided with a spur adapted to enter the end of the projection. A lug extending from the end of the lower member of each bracket and beyond the upwardly extending member engages a staple on the cover when the latch of the cover is in its full locking position.

SHUTTLE GUARD FOR LOOMS.—MAJOR T. MELVIN, Fall River, Mass. To provide a shuttle-guard which shall prevent the shuttle from leaving the loom, should it fly out of the shed, is the object of the present invention. The guard comprises brackets having apertures, a rod secured at its ends by the brackets, and a connecting-piece for the brackets formed at its ends with reduced extensions passing through the apertures in the brackets.

ADJUSTABLE CHAIR.—DAN E. CARTER, Traverse City, Mich. By the combination of a stationary frame and an adjustable frame, this chair is adapted for use as a lawn-chair, a reclining-chair, an invalid's chair, a couch, or a stretcher. The back, seat, and direct support for the lower limbs of the person occupying the chair are made of canvas, which, by means of a roller, may be placed under any desired tension.

COMBINED CLOTHES RACK AND CLOSET.—EUGENE CHRISTEN, Decatur, Ind. The combined clothes rack and closet has its back fastened to a support and provided with hooks. A shelf is supported from the back. Segmental doors hinged to the ends of the back abut against each other at their free ends. The top of the doors and the shelf are connected with a flexible cover. A mantle made of two pieces of fabric is attached to the doors.

COMBINED CANE AND FOLDING-CHAIR.—NIELS CHRISTIANSON, Brooklyn, New York city. Two half-tubes curved at one end to form a cane-handle or crook and hinged together, serve as the casing of the cane and the back of the chair. A seat-bar curved to lie in the crook of each half-tube extends down to about the middle of the tubes, and is pivoted to swing outward, being held in this extended position by a post adapted to lie within the tubes.

Designs.

CIGAR-COUNTER UTENSIL.—WILLIAM E. PARSONS, Jr., New York city. This design provides a box of cigars supported by a standard, an alcohol lamp, before which are placed two cigar-lighters, and a cigar-cutter situated in front of the casings of the cigar-lighters.

GAME-BOARD.—SIMON M. LUTZ, Bedford, Pa. This game-board is an ordinary checker-board, having an additional row of squares running both vertically and horizontally at the center of the board. These additional rows are red in color and constitute a red cross. When upon the red cross, a player is upon neutral ground, as it were, and cannot be taken; he has, moreover, other privileges which may be decided upon before the game.

CLOCK-BACK.—NATHAN L. WHEDON, Everett, Wash. The leading features of the present design consist in an offset on the back and in star ornaments of the surface.

COVERED DISH.—ADOLPHE PAROUTAUD, New York city. The body of this dish has an upward swell, the upper portion of which is interrupted by embossed ornaments. Ribbon-like handles are provided for the body and the cover.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for 10 cents each. Please send the name of the patentee, title of the invention, and date of this paper.

NEW BOOKS, ETC.

MILITARY NOTES ON THE PHILIPPINES. War Department. Washington, D. C.: Adjutant-General's Office. November, 1898. Pp. 309. 8vo.

An excellent collection of notes compiled from the best data supplied by the military map of the island of Luzon, plans of the cities and charts of the bays, harbors, etc.

BUSH FRUITS. By F. W. Card. New York: Macmillan Company. 1898. Pp. 533. 113 illustrations. 12mo. Price $1.50.

This is the sixth volume of what is known as the "Rural Science Series," which is intended to include books which state the underlying principles of agriculture in plain yet scientific language. They are suitable for consultation alike for the amateur and professional tiller of the soil, the scientist or the student. They are edited by L. H. Bailey, of Cornell University, N. Y., which is in itself sufficient guarantee of the excellence and accuracy of the volumes. The book before us is most valuable, and it is an extension of the thesis presented to Cornell for the degree of Master of Science and Agriculture. The author was a bush fruit grower before he was a university student. He is now Professor of Horticulture in the Rhode Island College of Agriculture and Mechanical Arts, so that in this instance an ideal combination of the practical man and the scientist is consummated.

BOILERS AND FURNACES. Considered in Their Relations to Steam Engineering. By William Barr. Philadelphia: J. B. Lippincott Company. 1899. Pp. 405, 468 illustrations. 8vo. Price $3.

It is a pleasure to examine a technical book which is gotten up in such excellent form as the present work. The page is large, the type is clear, the illustrations lucid, the text and the tables are valuable. The author is already well known in steam engineering; so that he hardly needs the present book to assure the reader of his professional standing. No one is better qualified to treat of the subject. The book is of great value, and will be warmly welcomed by all who are interested in manufacturing or using boilers. It is a book we heartily recommend to the mechanical engineer.

COTTON. By C. P. Brooks. Lowell, Mass.: C. P. Brooks. 1898. Pp. 362. 8vo. Profusely illustrated. Price $3.

The present volume deals with cotton—its use, varieties, fiber, structure, cultivation, and preparation for the market and as an article of commerce; also the manufacture of the cotton seed, and fertilizers, with a special reference to cotton growing, ginning, and oil pressing in the United States. The author was formerly the Director of the London Technical School and is a recognized expert on the textile industry, both in the United States and in England. Cotton is the greatest of all fiber products, and the present volume deals in a thoroughly scientific manner with the interesting problems which the growing, ginning, and shipping of cotton involve. The volume might readily have been made dull and uninteresting, as books on textiles are almost sure to be, but instead it is filled with interesting illustrations and is printed in clear type, admirably illustrated by high class engravings, although some of the engravings of the machines show their origin, the trade catalogue. The text is interesting even to the general reader, and we do not see how anyone who is interested in any way in the cotton industry can fail to own this really important volume.

PRISMATIC AND DIFFRACTION SPECTRA. Memoirs by Joseph von Fraunhofer. Translated and edited J. S. Ames. New York: Harper & Brothers. 1898. Pp. 68, plates. Price 60 cents.

Fraunhofer in 1814 worked independently of Wollaston, and discovered the lines in the solar spectrum which now bear his name. The paper of Fraunhofer in which he describes the results of his experiments is printed in full in this volume. The great merit of Fraunhofer's work is the systematic, logical method by which he proceeds from investigation to investigation. All modern work in spectroscopy is based upon that of Fraunhofer, and a brief bibliography of the most important contributions is appended to this volume. We believe that this is the first volume of "Harper's Scientific Memoirs" we have reviewed. A number of volumes are in preparation which will deal with original memoirs by celebrated physicists.

THE FREE EXPANSION OF GASES. Memoirs by Gay-Lussac, Joule, and Joule and Thomson. Translated and edited by J. S. Ames. New York and London: Harper Brothers. 1898. Pp 106. Price 75 cents.

The present volume is another one of "Harper's Scientific Memoirs," and the remarks made above upon the importance of series of this kind are borne out by the work before us. The papers are accompanied by biographical sketches of Gay-Lussac and Joule. They will prove of great interest to the physicist.

FOWLER'S MECHANICAL ENGINEERING POCKET BOOK FOR 1899. By William H. Fowler, A.M.I.C.E. Manchester, England: Scientific Publishing Company. 1898. Pp. 324. 18mo. Price 60 cents.

The author is the editor of The Mechanical Engineer, which, though started only a short time ago, has already shaken up the dry bones of English technical journalism. There was an ample field for this newspaper in England, and we feel sure there will be for this new pocket book, which is certainly published in a cheap and useful form. There must be some reason at the present time for the infliction of another pocket book, but the quality of the little volume before us is sufficient to demonstrate its right of existence. Though not as expensive as many of the English pocket books, it is doubtful if any of them will prove of more value to the mechanical engineer. It is a book which we heartily recommend.

SEWERAGE. THE DESIGNING, CONSTRUCTION AND MAINTENANCE OF THE SEWERAGE SYSTEM. By A. Prescott Folwell. New York: John Wiley & Sons. 1898. Pp. 381. 8vo. Price $3.

For a number of years the author has been looking for the appearance of a work on sewerage which should embody the most recent data and ideas relating to the subject and treating of both the combined and supply systems in a comprehensive manner, recognizing the fact that such a work is needed by engineers and engineering schools. We have also looked for a work of this class, and it has not been forthcoming. In view of this fact, the author has undertaken the task of supplying the deficiency. While primarily intended for practicing engineers, the work has also been arranged with the idea that it may be useful as a text book. The book will interest many engineers who have desired a really modern book on sewerage.

Business and Personal.

The charge for insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

Marine Iron Works. Chicago. Catalogue free.

"U. S." Metal Polish. Indianapolis. Samples free.

Gasoline Brazing Forge, Turner Brass Works, Chicago.

Yankee Notions. Waterbury Button Co., Waterb'y, Ct.

Handle & Spoke Mchy. Ober Lathe Co., Chagrin Falls, O.

For bridge erecting engines. J. S. Mundy, Newark, N. J.

Astronomical Telescopes, Lohman Bros., Greenville, O.

FERRACUTE Machine Co., Bridgeton, N. J. Full line of Presses, Dies and other Sheet Metal Machinery.

Inventions developed and perfected. Designing and machine work. Garvin Machine Co., 141 Varick St., N. Y.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4. Munn & Co., publishers, 361 Broadway, N. Y.

For Sale or Royalty, United States Patent No. 617,649. Improved Ice Skate. See cut and description on page 52, this issue. C. F. Filor, care S. S. Moore, Trenton, N. J.

Roche's "New Standard" Electric Necktie Pin. Works like a charm. Midget Battery. The electric light is a beauty and a wonder. Sent postpaid for $1.00. Agents wanted. Wm. Roche, 259 Greenwich St., New York.

☞ Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway New York. Free on application.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(7576) J. A. W. asks: 1. Which is the better way to make core of induction coil—of disks of soft iron and tissue paper like an armature core or to make it of small iron wire? A. The core of an induction coil is arranged so that it can be magnetized lengthwise as easily as possible. It is therefore made of wires extending through it lengthwise. These are shellacked to prevent magnetic continuity through the mass crosswise, so that each wire shall act alone. In the armature core of a dynamo the object is to have the magnetic flux crosswise. Hence, disks of sheet iron are used, and the flow of magnetism lengthwise is prevented by disks of paper. These arrangements cannot be interchanged. Both coil and dynamo would be ruined. 2. Is there any advantage in shellacked wire over bare wire? A. Yes; it insulates the wire. 3. Have you any back numbers with a good article on coil making? A. A good coil giving a 6-inch spark is described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 1124. A smaller coil is to be found in SUPPLEMENT, No. 160, price 10 cents each.

(7577) J. H. B. asks: 1. Can you tell me how to make a primary battery that will give eight volts and three amperes for lamp work, and that can be built and run at a reasonable price? A. Five cells of bichromate plunge battery will give you this current. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 792, for plans and description of this battery, price 10 cents. 2. Can you give me any information or reference where it can be found in regard to photographing an eclipse of the moon? A. Lunar photography is not different from any other astronomical photography. A good equatorially mounted telescope with clock work is required. Attach a camera in place of the eye piece and expose as for any other photograph. We fail to see what advantage there is in photographing the moon in eclipse, since there is less light then than at other times, and the moon has little light at best. Todd's "New Astronomy," price $1.50, will give you simple instructions for celestial photography.

(7578) J. T. F. writes: Five dynamos, each of 20 lights, are run by five different engines. Can the current from these five machines all be turned into one line and run 100 lights? If so, supposing that one of the machines is weak or gets out of order and fails to generate a current, are there devices made that will cut it out of the circuit without injury to it or the others? A. The five dynamos supposed in your query may be connected in parallel to the line, and each will send its current of the same voltage into the line. Such an arrangement is not to be approved. There are numerous automatic cut-outs on the market for breaking circuit, should anything whatever happen to one of the machines.

(7579) F. A. B. asks: Would it not be just as well to use a solid iron hoop in place of the iron wire ring for the armature core of the motor and dynamo described on pages 497 to 508 of "Experimental Science"? A. A wrought iron ring may be used in place of the wire ring of simple electric motor as an armature core.

(7580) E. M. M. asks: How can I construct a resistance coil so as to reduce a current of 150 amperes to 8 or 9 amperes, so I can charge a storage battery by attaching to the incandescent line? Or give me some simple method of accomplishing this. A. If you wish a current of 9 amperes, divide the voltage of the current by 9. The quotient is the number of ohms of resistance required. You do not tell us the voltage, nor do you give the number of cells in the battery to be charged—both absolutely necessary to be known to solve your question. See answers to query 7232.

TO INVENTORS.

An experience of fifty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

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For which Letters Patent of the United States were Granted

JANUARY 17, 1899,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

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Alkyl-purin and making same, E. Fischer 617,985
Anthraquinone derivative and making same, O. Bally 617,981
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Car brake, J. C. Devlin 617,722
Car brake, C. V. Rote 617,773
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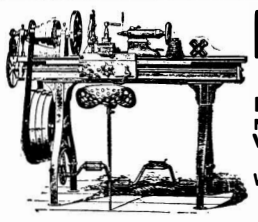

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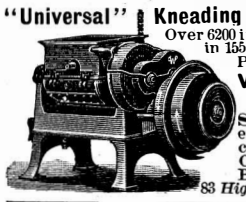

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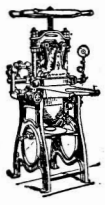

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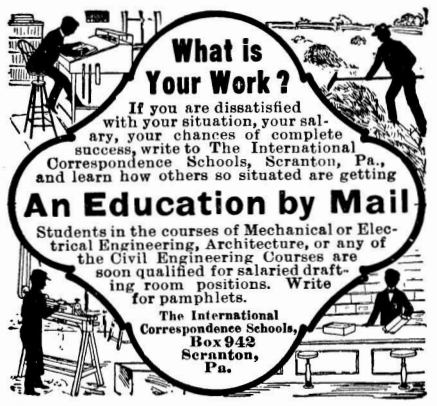
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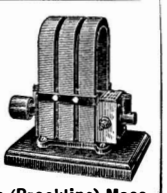

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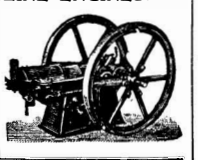

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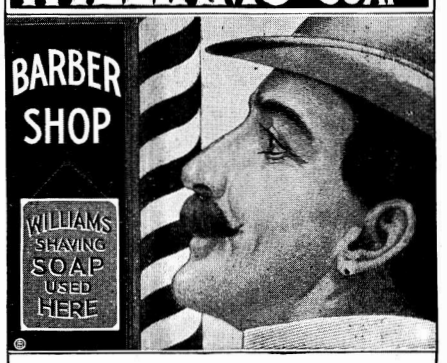

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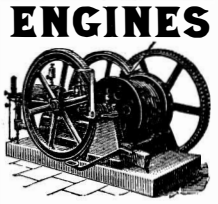

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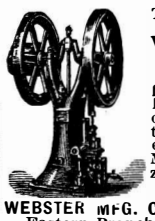

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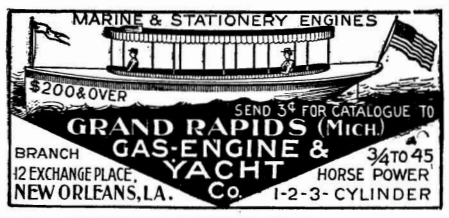
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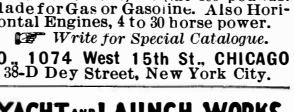

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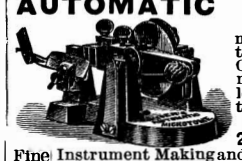

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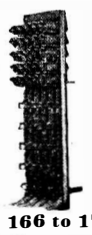

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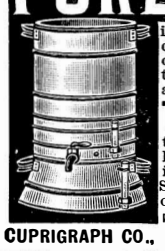
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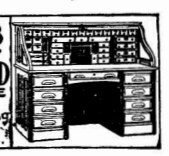

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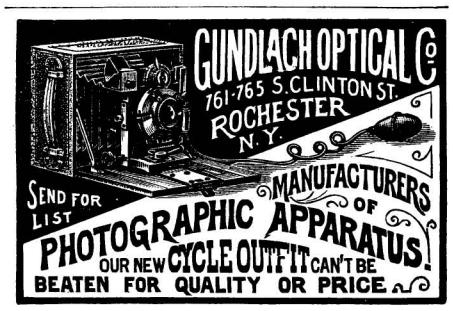

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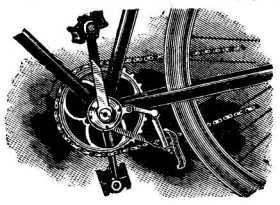

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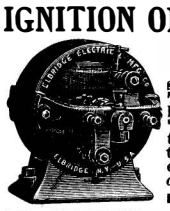

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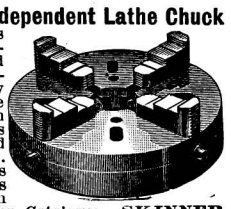

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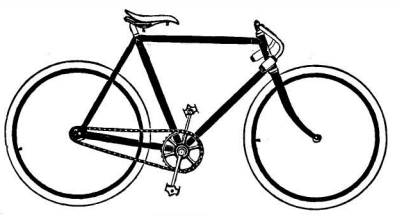

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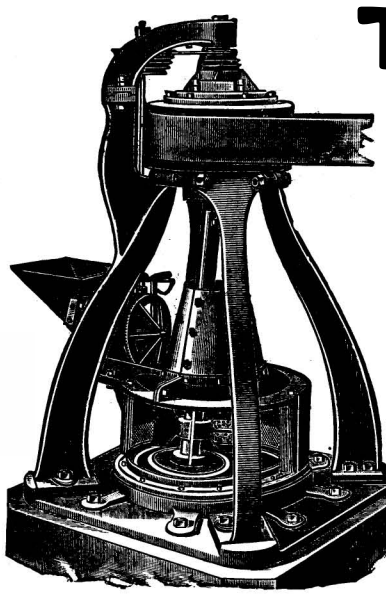

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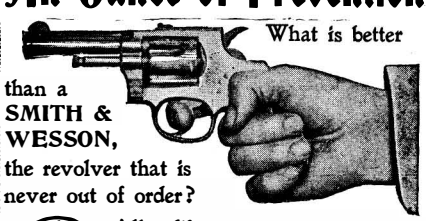

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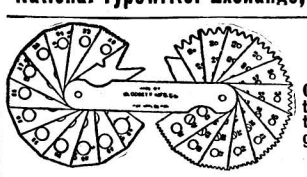

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